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AND

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THE OFFICIAL ORGAN OF THE BRITISH FOUNDRYMEN'S ASSOCIATION.

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THE FOUNDRY TRADE JOURNAL,
165, Strand, London, W.C.

BRITISH FOUNDRYMEN'S ASSOCIATION.

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Manchester: C. Carson Bransby, 113, School Road, Stretford.

Birmingham: C. Heggie, 76, Hillaries Road, Erdington, near Birmingham.

Cardiff: R. Griffiths, Messrs. J. Williams & Sons, Ltd., Globe Foundry, Cardiff.

THE BRASS FOUNDRY OF MESSRS. MARSHALL, SONS & COMPANY, LIMITED, GAINSBOROUGH.

FEW engineering establishments have made such rapid progress as the above firm, who are now employing close upon 4,000 workpeople. But my particular object is to speak of the brass foundry. This, I am led to understand, at one time was on a much smaller scale, but the continued expansion of trade in connection with the Britannia Works has necessitated the erection of the present commodious structure, which is used for brass work only, and of which the following is a brief description.

The main foundry is about 140 ft. long by 44 ft. in width, approximately, of course, seeing that pattern racks extend in one place for some distance outside the general contour of the shop, and again at the west end there is also a pattern gallery 11 ft. wide, with shelves some hundreds of feet in extent; here are kept the pattern plates, now 1,600 in number, for the ten moulding machines. The pattern plates are of such a miscellaneous character as to baffle description, and here, I might say, we save time again by lettering and numbering the plates; and if a gross of castings are required from any particular plate, it is simply necessary to quote the number and letter, each class of work having, of course, its price also.

But this gallery and racks, whilst holding such a multitude of patterns and plates, by no means comprise all, as we draw from the general pattern stores hundreds of patterns for bench and floor work.

Again, the old foundry was originally of one span, but the present one has two spans, supported and girdered from end to end and lit by electric light, 10 lamps of 1,000 candle-power each being used for the purpose, arranged in two rows, and controlled from a switchboard in front of the office.

The roof is arranged for ventilation through the full length of the shop; also over the furnaces are arranged traps or shutters, which can be opened when desired.

The furnaces for melting the "alloys" of gun-metal, and many kinds of bronze and brass, are 14 in number, and comprise furnaces capable of melting 300 lbs. or more down to the usual 100-lb. size, and though many new types of furnaces have been offered to Messrs. Marshall, so far not one has been accepted, seeing that from morning till night such a miscellaneous number of "alloys" are constantly in demand, and the turn-over type, and contrary to much that we hear from time to time of other machines, we have not been able to supersede this class of machine for the work we have to do, as many of the castings required have very deep lifts, up to 6 in. or 8 in., or even more in some cases, and these are carried through satisfactorily.

Let us next turn our attention to the provision for drying the cores, so necessary, for here we have bushes, plungers, pumps, water-gauges, valves of every description, including check and slide valves, brasses, etc., of every description; these require cores, and sometimes of an intricate nature. The stove most used is

GENERAL VIEW OF SHOP FROM PATTERN GALLERY. MESSRS. MARSHALL, SONS AND COMPANY, LTD.

the password "Urgent" must be obeyed. For the heavier crucible work we have a small ½-ton crane for drawing the metal out of the furnace. For the heavier class of moulding on the floor we have a 2-ton crab that runs along the girders in the centre of the foundry.

White metal lining of brasses is carried out at the top end of the foundry, away from the furnaces and general run of work. Here, when necessary, we have a boiler to use for any of the softer white metals and lead.

The moulding machines, so far, that have been found of most use here, are of one that comprises 12 ovens, and into these are packed the cores for drying. In the illustration it will be noticed the ovens are three high, and the stove is fired from end to end; thence the heat passes under the lower row and back again under the second row, and from here up and back again under the top row, and then direct into the flues, and away under the floor to the main chimney, which is 100 ft. high. The larger oven shown in the illustration is used more especially for larger work, generally loam work.

Standing away from the main foundry

is the fettling shop, replete with all that is necessary to handle expeditiously the vast amount of work that has to be got through, amounting to about 40 tons a month. Here we have a large mill for grinding all ash from the furnaces, and also the old crucibles, yielding up a certain amount of metal, the grindings passing through a washer, and but a slight percentage is lost after such careful treatment. This is an important factor in the costs of the foundry, especially at the present time of such high prices of raw material, including tin and copper, of which so much is used.

Turning again, we have the blow-house set apart for sand blasting, and the rumbler, to both sides of which are attached the sand-blast, so that work of a smaller nature is being rumbled and cleaned by the sand-blast at the same time.

Then there are the emery wheels, five in number—one large and four smaller ones—together with a circular saw and a gate-cutter, the latter worked by the pressure of the foot.

In addition to the above, we have a second mill for the grinding of sand and loam, but this is situated outside of the foundry altogether, and is used apart from the ash-grinding mill mentioned. This, for us, is a vital necessity. And, lastly, we have also a storage for our boxes, but under cover to protect them from the weather, so that the ones not in general and everyday use are always taken away, and do not hamper in any way the work of the shop.

With such an equipment there is small wonder that a large amount of work is got through, and here, I may say, only the best work is tolerated, and much of it has to pass the testing by steam to 200 lbs. to the square inch; but with the methods employed these conditions are satisfactorily fulfilled.

SMALL CORE OVENS. MESSRS. MARSHALL, SONS AND COMPANY, LTD.

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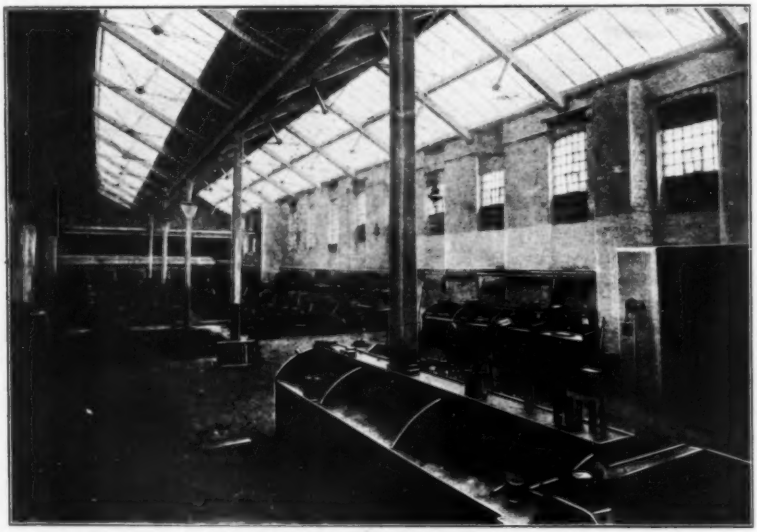
MR. J. MAY and MR. G. W. SPENCER HAWES have terminated their connection with Messrs. Robert Hammond & Son, and have started in business as consulting electrical engineers, as May & Hawes, Caxton House, Westminster, London, S.W.

METHODS OF KEEPING FOUNDRY COSTS.*

THE system herein outlined is one I consider the best suited for a general jobbing business, and permits of great flexibility. It can be adapted to a large or small shop, shows absolutely what the castings are costing, and can be kept with the minimum amount of clerical help. Another advantage is that it is not too complicated, but can be readily understood by any intelligent person without a knowledge of book-keeping. No doubt you will take exceptions to some parts of the system, but as a whole, it is as nearly correct as can be got.

The Jobbing Foundries Association.

The object of the Cost Committee of the Jobbing Foundries Association is to outline a uniform system of foundry cost keeping to meet the requirements of all shops doing a medium or heavy grade of work, and, when found suitable in the judgment of the Committee, to submit it to the various foundries and ask them to adopt it or something nearly like it. We hope in this way to create a better feeling in the foundry business and avoid the ruinous prices on work that have been



THE SHOP LOOKING WEST. MESSRS. MARSHALL, SONS AND COMPANY, LTD.

A foundry business is peculiar in a great many respects, unlike any other manufacturing business, on account of the uncertainties regarding product, amount of material and supplies used on any particular job. This makes it a very difficult matter to get an accurate system of costs, the supplies for any job and apportionment of indirect charges in the different plants being so varied, and such a factor in the past few years. I do not know of any manufacturing business where so much is invested where so little is known as to actual cost of product as in this business.

We do not intend to convey the impression that we wish any foundry to adopt any particular way to keep its accounts. Its book-keeping can be kept to best suit itself, so as to arrive at the proper charges to be taken care of for the month, and the proper distributions made when their general books are closed. I wish to impress on every foundryman the neces-

* Paper read by J. F. Johnson, auditor of the Braddock Foundry and Machine Company, Braddock, Pa., before the Pittsburg Foundrymen's Association, March 4.

sity of having first-class clerical help, or the best results cannot be obtained from this or any other system. Most foundrymen are content to have one or two men about them, acting in the capacities of foundry clerk, shipping clerk, timekeeper, storekeeper, bookkeeper, and probably stenographer. You cannot expect to get any accurate results from such a working force. Then men are probably overworked and underpaid, the work is not of the cleanest, and the hours are long. Besides, the man who is able to fill all of these positions satisfactorily would not be engaged in the foundry business, country doing a general line of jobbing work can get its indirect expenses so low as 75 per cent. of the direct labour. I would say that 150 to 200 per cent. would be nearer.

The most important object of the Jobbing Foundries Association is to get a good system and have various foundries adopt it, and find out their true cost, and in this way avoid ruinous prices in the future. I am satisfied that no sane man will take a job if he knows he will lose a certain amount beforehand. I have in mind now a foundry that has taken work away from us at a very low price, the

FETTLING SHOP AND BLOW HOUSE. MESSRS. MARSHALL, SONS AND COMPANY, LTD.

as he could get better remuneration for such services elsewhere.

The Hit or Miss Plan Criticised.

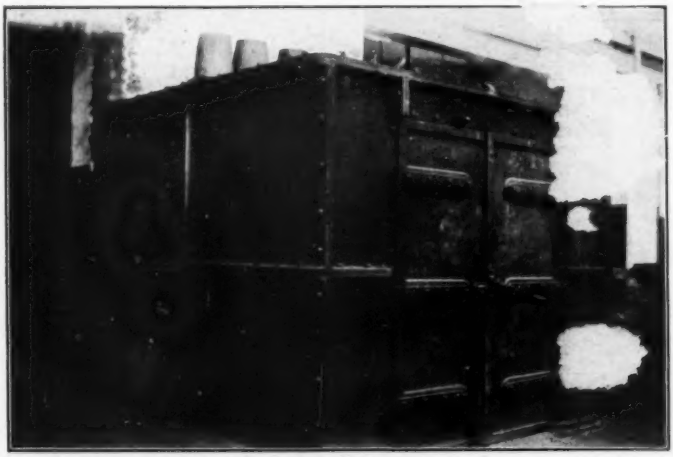
From my observation, the foundry business is conducted on the hit or miss plan. Large contracts are taken every day by parties merely looking at the blue prints, and prices, quoted at once without going into any details as to amount on account of defective work and unavoidable causes. It appears to be the general impression that foundry costs are arrived at by averaging the cost of metal, adding the direct labour and then adding about 75 to 100 per cent. for fixed and general charges. This is a gross mistake, as I venture to say that no foundry in this price being over ½-cent a pound lower than we had been getting. The founder had the extra freight against him also, we being located where deliveries could be made by team. I am positive that this foundry does not have any idea as to the cost of its product, or it would not have taken this work at the prices it did. We found after doing the work for a period extending over two years that we could not produce these castings for anything like the price it is getting. This is merely one case of many. I often notice in the papers the sale of foundries, and the appointment of receivers for others. What is the cause of all this? They have simply been selling their product without knowledge as to its cost.

I have gone far enough, I think, explaining the object of getting a universal cost system for foundry businesses, and hope all foundrymen will give this feature of their business their special attention, and in the future it will be for the benefit of all.

Details of a Cost System.

I have the different forms used at our plant and will try to explain as best I can their individual uses and the different steps taken to arrive at the monthly cost, both the average price per pound and the cost of each job.

The first step is to enter the order taken by giving it a shop order number and issuing shop bills of material to the different departments interested. This, I think, is a universal practice and understood by every one present. In addition to this shop bill we issue to the moulder a small card, giving the shop order, pattern number, and number of pieces to be made. He is thus better able to report his time on the job, and incidentally it affords an additional check on the number of pieces made, as he keeps a record on this card of what he moulds, and turns it in to the foundry clerk each evening. This helps to prevent castings being made in excess. We next issue to each man every day, a time slip, and he makes this out after the completion of his day's work, and hands it to the foreman before leaving. We find this more satisfactory than having the foundry clerk take the time, as it gives the clerk a check on the time by comparison with his record when a pattern is changed. Every day a report is made by the foundry clerk of the cast, giving the shop order number, number of pieces, pattern number, and weight of castings, both good and bad. We next have a record of all metals charged in the cupola during the month, giving date, kind, and weight. This can be kept in book form or on a loose sheet. The next step, and one of the utmost importance, is to have a storeroom, where all materials are kept for stock, and these materials can only be got by an order from the foreman. A responsible party must be in charge, one able to compile a report at the end of each month of all material used and to be charged to the proper accounts. The true cost cannot be had unless this is done.



LARGE CORE STOVE. MESSRS. MARSHALL, SONS AND COMPANY, LTD.

This storehouse report is credited every month to stores account and proper jobs and accounts are charged. A periodical inventory is taken to compare the actual stock on hand with the book value, and thus keep a check on the storekeeper as to the correctness of his accounts. This may seem needless work, but it is a good feature, and sometimes prevents thefts and careless work.

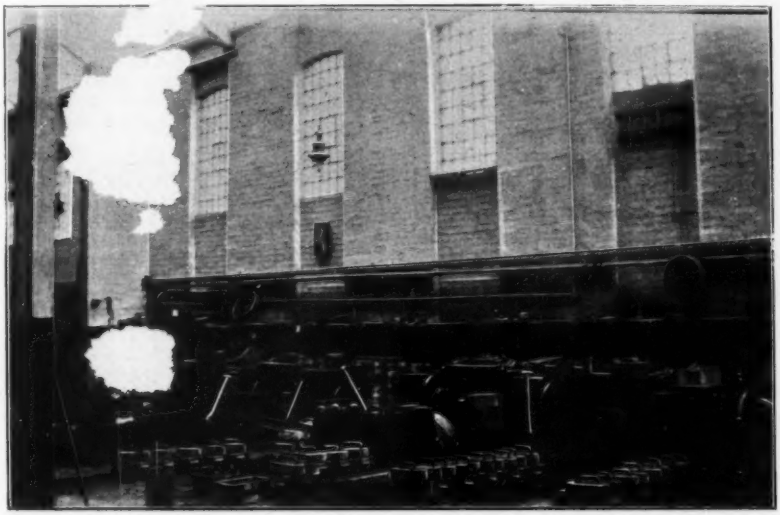
As the time slips are received each day in the office, after being approved by the foreman, these are entered on a distribution or operating sheet, giving the shop order, pattern number, class of work,

time, and amount. At the end of the month these sheets are added, and results are shown on the recapitulation sheet. This gives the total moulding costs and labour on each job. The cost of the different pattern numbers can be taken from the sheets at any time after closing the month's work, so as not to delay the closing of the month's business.

Another report of great value to us we call a summary of the product. This report gives the average number of moulders and men employed during the month, with product, average pounds per moulder per day, average weight of piece for the month, and other useful information, for the sake of comparison with other months.

also the different items, the practice and average cost per pound. This can be compared with previous months, and if running on the same class of product it keeps a check on the foundry, and enables one to tell if certain expenses are increasing or decreasing, and in what amounts. I would advise all to keep this cost, as the foreman can be called to account if found that the foundry is running unsatisfactorily.

We have now reached the final stage or step—a cost sheet showing the actual cost of each job, the metal, direct labour, apportionments, and total cost. On the left-hand side is shown the selling value. By merely glancing at each side one can



Row of Moulding Machines Messrs. Marshall, Sons and Company, Ltd.

We are thus able to tell if our product is varying, and to what extent. This report is self-explanatory, and can be compiled very easily.

We now come to the Final Steps, which are arrived at after the books are closed and all expenses determined. It is nothing more or less than a final recapitulation of foundry product, showing costs of different items, as obtained from the books. These figures are actual, and are bound to be correct, on account of being taken from books that are supposed to be correct. This sheet shows the actual cost of foundry product for the month, readily see which jobs are losing and which are profitable. The selling price per pound is obtained from the estimates on the work, and where no estimates have been made the price is used which the foundryman intends charging the customer for this work. In arriving at this final result the matter of apportionments has been considered carefully, and we think our method as nearly correct as it is possible to obtain. I base this assertion on these statements for the following reasons :—

All fixed charges should be apportioned on the productive labour, because time is the factor, and these expenses are the

same whether the output is large or small, and the product is also regulated by the time the floor space is occupied by certain pieces of work. All expenses which are regulated by the output should be apportioned on the weight, because weight is the factor, and more expenses are necessary for the larger pieces, and because these expenses are governed by the weight, that is, such items as flask supplies, fuel for cupola, yard labour, cleaning, etc., which fluctuate according to the output.

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DIRECT-READING ELECTRICAL PYROMETERS.

THERE are many industrial and engineering operations which require the maintenance of a definite temperature, or in which accurate temperature measurements are of importance. In many cases the processes have to be carried on under conditions which preclude the use of ordinary or expansion thermometers. The instrument illustrated and described herewith has been designed to meet these cases, and to meet the demand for a simple apparatus for measuring temperatures in practical engineering work. It has already been successfully applied in measuring the temperatures of hardening and annealing furnaces; of gases in boiler flues; of the steam in steam pipes; and is applicable to a very wide range of engineering practice. The instrument is used without any batteries, is strongly constructed, and is easy to handle. It indicates the temperature continuously, and in using it no skill is required, as the temperature is read directly on the scale, no corrections being necessary.

The pyrometer is of the thermo-electric type, and generally consists of three essential parts, viz.:—(1) A thermo-electric couple; (2) the indicating instrument; (3) the leads connecting the instrument to the coupling. The thermo-electric couple is placed at the point the temperature of which is to be determined; the indicating instrument can be placed at any convenient position, even at a reasonable distance from the couple. The couple is formed by welding together at one end two rods or wires of dissimilar metals. The welded end forms the hot junction, and the other ends of these rods are provided with terminals, from which leads are taken to the indicating instrument, which forms the cold junction of the circuit. The materials of which the couple is constituted depend on the maximum temperature which is to be measured. For temperatures up to 1,000 or 1,100 degrees Centigrade the couple is constructed of nickel and steel. A nickel rod runs down the centre of a steel tube without touching it, and at one end the two materials are welded together. At the other end terminal clamps for the connecting leads are brazed to the rod and tube. For measuring temperatures of boiler flues, superheated steam, and in other cases where the temperature does not exceed 500 degrees Centigrade, a couple is used having for its elements constantan and copper in place of nickel and steel. The welded end of the couple is placed at the point where the temperature is to be measured. The temperature of the rest of the couple does not materially affect the readings of the instrument.

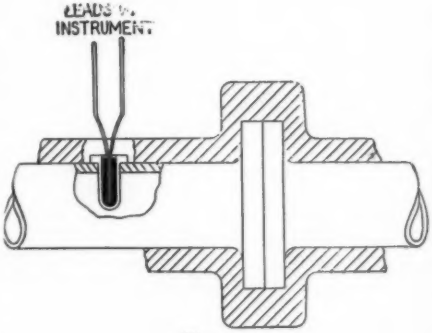

FIG. 1.

The design of the couple is varied to meet the requirements of each case. The pyrometer is very commonly used for measuring temperatures at various parts of a steam system, such as the valve boxes, steam chests, and different points of the pipe line. Small wells, or pockets, to receive the couple, are fixed at the points where the temperature is to be measured. Fig. 1 shows a pocket fixed in a steam pipe of large diameter with the couple mounted in it. Fig. 2 illustrates one type of couple used in the small steam pipes of steam motor cars, etc., for indicating the temperature of superheated steam. In some cases where the steam pipes are too small to admit of a pocket, and where there is no convenient flange-joint, the couple should be fastened to the pipe and heavily lagged.

The metals forming the couple of a pyrometer, when exposed continuously to some furnace gases at a red heat, are

gradually destroyed. The couple has therefore been specially designed so that it can readily be replaced at a low cost. The lower the temperature to which the couple is continuously subjected, the longer it will last; and copper-constantan couples, when measuring temperatures up to 500 degrees Centigrade, are stated to have a very long life. The life of the couple is considerably increased by protecting it with a renewable steel sheath or a porcelain cover, or by embedding it in a shallow trough containing silica.

The indicating instrument is usually of the sector pattern, and has a scale about 10 in. long. The scale of the instrument is constructed to take into account variations in the temperature of the indicator, these variations being measured by a small thermometer attached to the face of the instrument.

The Connecting Leads.—These may be of any length within reasonable limits, and in ordinary circumstances are of the

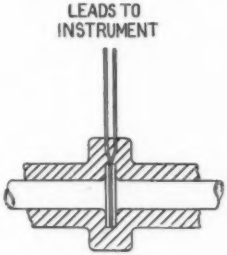

FIG. 2.

same materials as the rods forming the couple. With the nickel and steel couple stout wires of nickel and steel are used; nickel wire from the nickel rod, and steel wire from the steel tube, so that the materials of the couple are continuous up to the indicating instrument. The two connecting wires can be run to the furnace in any convenient manner; care has to be taken to keep them from touching one another, or any metallic conductor. It is generally found convenient to run the wires in casing, on wooden cleats, or on insulators fixed to the wall or roof. In the copper-constantan couple, the connecting leads are generally of copper and constantan, and the instrument terminals are suitably marked.

Fig. 3 gives a view of a short pyrometer plug for screwing into a stop-valve or steam pipe.

The pyrometer is also made up in portable form, the instrument being contained in a light wood case, and when so arranged it is very convenient for the use of boiler inspectors, etc., for boiler tests, investigation of flue temperatures, etc.

In this instrument the couple is of constantan and copper, which metals are known to be thoroughly reliable in their thermo-electric properties; it is protected by a light steel tube with a removable cap on the lower end, and at the cool end substantial terminals are fitted for the connecting leads. The indicating instrument is similar to that used in the ordinary pyrometer. It is usually scaled up to a temperature of 1,000 degrees Fahrenheit, but can, if necessary, be made to

FIG. 3. — SHORT PYROMETER PLUG, FOR SCREWING INTO STOP-VALVE OR STEAM PIPE.

read to 1,200 degrees Fahrenheit. This portable form has been found of service for measuring the temperatures of the gases in various parts of boilers and flues. Valuable information about the condition and efficient working of tubular and other boilers can be obtained from periodical measurements of the temperature of gases at different points.

For the above particulars and illustrations we are indebted to the makers—Messrs. Crompton & Company, Limited, of Colchester.

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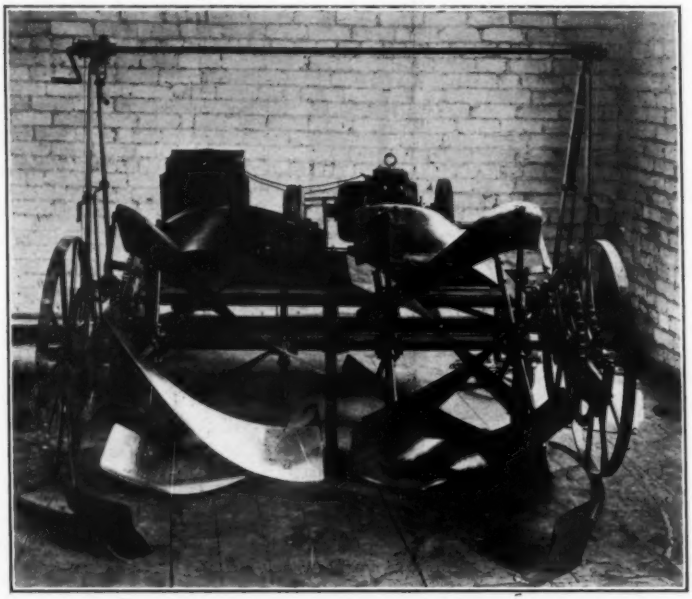
A FOUNDRY SAND MIXER.

EVERY year sees more labour-saving appliances introduced into all branches of work, but up to the present time the sand heaps in the foundry have always been cut over by hand. Foundrymen have realised that this was a slow and costly method, but the general foundry conditions have thus far prevented the introduction of machinery for this purpose. At last, however, an inventor has turned his attention to this subject and solved the problem, the result being the Stockham mixer shown in the accompanying illustration, which is being introduced by Messrs. J. W. Jackman & Company, Limited, of Caxton House, Westminster.



A FOUNDRY SAND MIXER.

This machine is patented in both the United States and foreign countries, and is now ready for the market. It is self-propelling and may be driven by electricity or any other suitable motive power. When in operation the large or driving wheels advance the machine at such a rate that the rapidly rotating knives pass through the sand heap at intervals of one-half inch. The knives cut down through the heap and then throw the sand to the rear. The curved form of the knife blades is such that the sand is thrown up in a ridge behind the machine, just as it would be in the old mixing process, and the fact that each knife cuts from the top to the bottom of the pile and then distributes this amount of sand evenly over the pile results in very thorough mixing. It also makes it possible to introduce new moulding sand, facing material, or anything of the kind, by simply distributing it evenly over the top of the pile before the machine is sent through it. The machine is followed by a pair of scrapers which serve to trim up the bottom of the pile and leave it neat. The parts are made strong enough so that nails or gaggers in the sand will not injure the machine, while an automatic cut-out is arranged which instantly stops the machine if the blades strike any hard substance offering resistance, such as clamp, gate, or casting. It is claimed that under favourable conditions one of these machines can cut up 100 heaps of sand, each 60 ft. long, in ten hours. The machine complete

weighs 650 lbs., and can be operated with either direct or alternating current at any standard voltage. The machine can also be used for cutting up core sand by spreading the various ingredients one on top of the other in a heap, and then sending the machine along the heap. The mixing will be very much more thorough than that accomplished by hand shovelling. It is said that a machine of this kind can mix core sand or facing sand at the rate of ten tons per hour. When not in use, or when being removed from one place to another, the revolving blades are swung up clear of the floor.

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BRITISH FOUNDRYMEN'S ASSOCIATION.

THE Birmingham Branch of the British Foundrymen's Association have arranged a number of summer visits to local establishments of interest, one of the most successful being the inspection of the Tipton Green furnaces at Messrs. W. Roberts, Limited, on Saturday, the 15th June. The party numbered over 50 members, including Mr. R. Buchanan (the President of the Branch), Mr. C. Heggie (Secretary), Mr F. J. Cook (member of the Council), Mr. R. Mason, and others. The furnaces are generally agreed to be among the best in South Staffordshire, the management being especially successful in securing a large and regular output of iron of good quality. At present two furnaces are in operation, and a third is in course of preparation. The plant includes a very powerful equipment of blowing engines with full provision for such emergencies as partial breakdowns. A special feature is a series of calcining kilns, by means of which the ore is roasted for eight weeks, which, it is claimed, ensures a better quality of iron. The whole plant was fully inspected and the visitors were afterwards entertained to tea by the officials, Messrs. J. S. Donechay (Furnace Manager), G. Head (Secretary), and J. D. Northwood (Agent), all of whom had assisted in conducting the visitors round the works.

A vote of thanks was proposed by the PRESIDENT (Mr. R. Buchanan), to the directors and officials.

MR. F. J. COOK seconding, said there had always seemed to be a wide gulf between foundrymen and blast-furnacemen. He could not understand this, seeing how largely their interests were identical.

The vote was carried with acclamation.

MR. DONECHAY responding, said much had been said at various times about the decline of the iron trade in the Black Country. There had been cause for gloomy forebodings, but there was still plenty of reason for encouragement. Since he took over the management, the output from two furnaces had been increased from 550 tons to 1,300 tons per week. (Applause.) He hoped the time was not far distant when ironmasters in purchasing pig-iron would employ scientific analysis rather than fracture as a test of quality. The former was a much more reliable guide as to suitability for particular requirements.

MR. G. HEAD, also responding, thought that if blast furnacemen were taken into the confidence of foundrymen as to the purpose for which iron was required, there would be less disappointment, and rsults would be better.

The PRESIDENT agreed with Mr. Donechay in deprecating pessimistic talk about South Staffordshire. The figures given as to output showed what could be done by well directed enterprise and good management, and he had no doubt that the day was coming when pig-iron would be purchased entirely by analysis.

Visit to the University.

The session of the Birmingham Branch of the British Foundrymen's Association concluded on Saturday, June 22, by a visit to the Birmingham University, in which over 50 members took part, including the President (Mr. R. Buchanan), the Secretary (Mr. Heggie), and other leading members. Professor Turner acted as guide, and before exploring the departments the Professor outlined the general scheme, calling attention to the imposing proportions of the front hall and the external architecture, which is on massive lines. The tower, which is now in course of construction, and which will reach the exceptional height of 300 ft., will itself cost about £50,000. Nearly half a million has been spent on the building, but erection will continue for the next three years.

The Professor in each department has designed the general arrangements, and Professor Turner has arranged the several rooms on either side of the spacious corridor. Each department is completely furnished with the latest equipment, and there are fine things to be seen in the

rooms allotted to pyrometers, microscopes, photographic apparatus, balances, and laboratory equipment generally. There are specimens of brass casting apparatus, and a remarkably complete set of ore specimens, covering all the metals, and contributed from all parts of the world, in nearly all cases gratuitously by old students. The student can see for himself the best specimens of pig-iron, cobalt, gold and silver ore, with samples of pure silicon, ferro-silicon, etc. The Siemens' casting department is quite a speciality, all the rough work in this department being done by students, who charge, mix materials, and pour the metals. There is a miniature foundry and a set of annealing furnaces, with a spacious and well-equipped pattern-shop. The students had only a short time before doffed their overalls after completing their week's work in the shops. The University produces its own power, having a complete Mond gas plant and electric generators capable of yielding 1,000 horse-power. The machinery in this department cost £20,000. Professor Turner explained that the latest ideas had been adopted in the laying out of the University, after visits to such great institutions as the Massachusetts and McGill Universities of America, and the principal institutions on the Continent. Hearty thanks were accorded Professor Turner for his valuable guidance in the tour of the departments.

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THE directors of John Brown & Company, Limited, have arranged for the acquisition of an interest in the firm of Harland & Wolff, Limited, of Belfast. To meet this outlay the capital of the company is to be increased by the creation of 100,000 £10 preference shares and 500,000 £1 ordinary shares. Messrs. John Brown & Company have also acquired the Trent Iron Works at Scunthorpe.

THE Council of the Machinery Users' Association, in their report for the year ending March 31 last, state that during the year 126 firms in England, Scotland, and Ireland have been added to the roll of members. The Council report that the litigation in connection with the revaluation of the Cardiff Union has been concluded with results which were eminently satisfactory to all the appellants. Out of 23 cases dealt with a reduction of 17 per cent. was obtained in the assessments objected to.

THE FOUNDRY AS A BUSINESS VENTURE.

AT the convention of the American Foundrymen's Association, three papers were presented dealing with the business side of foundry work. Each was by a different member, the first being on "The Iron Foundry as a Business Investment," while the second and third dealt from a similar standpoint with the steel foundry and the malleable foundry. We present abstracts of Mr. West's below. The paper on the Steel Foundry was printed in the June issue of THE FOUNDRY TRADE JOURNAL.

The Iron Foundry.

BY THOMAS WEST.

The principal points to be considered by one embarking in the grey iron foundry business are the following:—

1. The great lack of skilled labour.
2. Influences retarding the trading of a plentiful supply of skilled mechanics.
3. Insubordination of many of the skilled men available.
4. Difficulties and losses from working with the riff-raff a new foundry is compelled to employ at the start.
5. The slow attainment of discipline and organisation.
6. Losses from defects developed in trying out new machinery and tools.
7. The advantage taken of beginners by sellers of appliances and buyers of castings.
8. Losses from accidents due to inexperienced operators of machinery.
9. The difficulty of obtaining good superintendents and foremen.
10. Losses and embarrassment caused by the narrow range of vision of hired managers.
11. Inability of proprietors, inexperienced in actual moulding, mixing, and melting, to avoid mistakes in picking managers and foremen.
12. Under-estimating the obstacles and uncertainties every beginner must encounter.

The difficulties enumerated above are encountered much more in brisk than in dull times, and may be the means of driving the most experienced workers and financial managers to the wall.

The difficulty of obtaining good overseers as well as skilled labour demands more consideration than does working capital, and often knocks out experience, good management and hard work. In

one instance that recently came to the writer's notice, a bookkeeper who never lifted a rammer put all his money into a small foundry and hired a farm hand to run it for him, while he maintained his salaried position. When his working capital was exhausted, he did not close his shop until he had involved others in his downfall. One thing is difficult to comprehend, and that is the great difficulty of making men inexperienced in the business realise its hazard as well as the fact that skill is required to make good castings.

SOME SUGGESTIONS.

The course one should pursue who has decided to start a foundry is indicated in the following :—

1. He should thoroughly investigate the demand for the class of castings he intends to make and what competition exists.

2. Select a site central to his market and build on as small a scale as practicable, planning for extensions that can be carried out without tearing down too much of the existing plant.

3. In the search for machinery and appliances he should get the experience of others. The A.F.A., convention should be visited, and its exhibits inspected for the latest improvements.

4. Avoid as far as possible the purchase of second-hand tools. The new has all its life, whereas the old is more or less worn out, and will not as a rule give good service for the money expended.

5. One not competent to quote prices should not be ashamed to seek his manager's or foreman's advice.

6. Don't be in a hurry to fill your shop with work. Go slow, feel your way, and your chances for error or failure will be greatly decreased.

7. Be sure to have sufficient working capital and good chances of obtaining more than is considered necessary.

No man who intends to be at the head of a foundry can be too thorough in the actual work of moulding, mixing, and melting, and he should have executive and business qualifications. There is no business demanding skill and experience wherein so many enter who are wholly deficient in practical knowledge of its operations. Thirty years ago, scarcely any thought of going into the foundry business if they were not so practical that they could discharge any moulder and take hold of his work in a more masterly manner. To-day we find bankers, lawyers, and even clerical men who assume to manage foundries.

"SOME MODERN BRASS FURNACES."

A LECTURE on the above subject was delivered to the Birmingham Metallurgical Society at the Technical School, Suffolk Street, Birmingham, on June 11th, by Mr. C. F. Davies, the chair being occupied by Mr. A. H. Hiorns, the President.

The lecturer remarked that though brass working was an ancient industry, no serious effort was made for centuries to deal with it in the foundry upon a large scale, and only within the last five years had brassfounders superseded the old coke-pot furnaces. It was a great advantage to melt larger quantities, especially for big castings or strip ingots, the effect being to increase the uniformity and homogeneity of the mixture. One man could look after all the metal required, and there was no danger of crucibles losing heat during pouring. Output was increased because the foundryman need not attend to pot furnaces, but could confine his attention to making moulds. The use of oil or gas promoted cleanliness, reduced labour in carrying fuel, ashes, etc., lowered the heat of the foundry, and abolished the noxious fumes associated with coke furnaces.

Four of the modern furnaces had proved successful, namely, the "Morgan Patent Tilting Furnace," made by the Morgar Crucible Company, Limited, of Battersea, and the "Steele-Harvey," "Rockwell," and "Schwartz," the three latter of America.

With the aid of a model, the lecturer described the Morgan furnace, which was made in three types and various sizes, dealing with from 400 to 1,000 lbs. Forced draught was used, and metal was poured without taking the crucible from the furnace. Tilting was effected either by a wheel at the side or by means of chains. The life of a crucible was from 40 to 60 heats, and it was claimed that 400 lbs. of brass could be melted in 40 minutes, with a coke consumption of 45 lbs. It was possible to take out six or seven heats of brass in a day of ten hours.

The "Steele-Harvey" was next described, which is smaller than the "Morgan," the crucibles taking from 120 lbs. With the smaller crucibles 15 to 20 heats can be taken, and with the larger 9 or 5. The oil consumption worked out at about 6d. per 100 lbs. of metal, or 11s. per ton.

A short description followed of the "Rockwell," which works without crucibles, the metal being melted in the furnace body itself. The apparatus consists of two chambers, which can be worked alternately. The heat can be got down in 40 minutes, and the oil consumption is about 12s. 6d. per ton of metal.

The "Schwartz" furnace is on the same lines, but with a single chamber.

Estimates were next given of comparative costs based upon a year's working per ton of metal melted.

Old pot furnace: Coke, 14s. 6d.; pot, 17s.; furnace repairs, 1s. 10d.; total, £1 13s. 4d.

"Morgan" furnace: Coke, 2s. 9d.; crucible, 7s. 6d.; furnace repairs, 1s. 3d.; power for driving, 1s. 6d.; ladles, 2s.; total 15s. Daily output six heats, or about eighteen hundredweight.

"Rockwell": Oil, 13s.; repairs to lining, 4d.; ladles, 2s.; power, 1s. 9d.; total, 17s. 1d. Number of heats ten to eleven per day, totalling about 1½ tons.

The CHAIRMAN opened a discussion with the suggestion that some such furnace as the "Morgan" should be adopted for the melting of steel in small quantities. It was a decided advantage that the crucible in the "Morgan" furnace had not to be removed, thus avoiding the cracks arising from rapid alternations of temperature. No doubt Messrs. Morgan had introduced a coke furnace, because English manufacturers were not accustomed to oil. They were satisfied to follow their fathers and grandfathers.

MR. THOMAS gave some examples of misfortunes with the new furnaces. Theoretically they were good, but if they got wrong, operations were entirely stopped for two or three days. Coke, at all events, had the advantage that they might depend upon having a supply. The big furnace was impossible to many foundries in Birmingham, which were operated in cellars and in the second stories of buildings. It would take up half the foundry.

MR. DAVIES, replying to questions, pointed out that any metal running away would be caught by the ash tray, and prevented from getting down the flue. It was easy to either hasten or retard the furnace by regulating both the supply of oil and the supply of air. He had found Texas oil quite satisfactory as a fuel at £3 a ton. There was no objection to the use of ladles, and they were very commonly employed.

A vote of thanks was accorded the lecturer.

THE DESIGN AND CONSTRUCTION OF FOUNDRY BUILDINGS.*

By GEO. K. HOOPER.

THE foundry business has become so specialised, and such rapid strides have been made in the elementary knowledge of the methods and requirements of manufacture that it is difficult to make any general remarks on the subject of foundry construction. I will, however, endeavour to describe some of the plants which I have designed and which comprise foundries devoted to the casting of the smallest forms of large sections with practically no core work, to the most specialised shops using machines almost exclusively.

For plants engaged in heavy work I have made designs in two ways. In one instance, owing to the form of the site and the location of the railroad tracks, it was found advisable to place the stock house and melting equipment at one end of the foundry, permitting all of the other operations to divide from that point as a basis. For this shop a straight, open building, three bays in width, was built, the second bay having been provided with cranes of sufficient capacity to handle the largest ladles, as in this case the work was such that the ladle of iron was the heaviest thing to be handled. Single rail electric travellers were also installed in the main and side bays, provided with suitable wedges to facilitate their movement from one department to another. In addition to serving the foundry these trolleys were used for cleaning up and for conveying scrap, sprues, gates, etc., from the foundry to the stock house.

The melting equipment was in the middle of one end of the foundry and was separated from it by a brick wall. The spouts of the cupolas projected through the latter and were adjustable so that large or small ladles could be filled at any distance from the furnace. The brick wall also kept the slag fumes out of the foundry and the drop was likewise confined, which made the work of cleaning up comparatively easy. The cored and small work was done close to the cupolas, while the large work, on which the temperature of the iron could vary considerably without affecting the castings, was placed where most convenient. It is unnecessary to

* Paper read before the American Foundrymen's Association,

state that such work as required the use of cranes was done in the middle bay.

Cleaning Department.

The cleaning department was located at the end of the building opposite the cupolas, partly in the centre and partly in the side bays, the design being such that as the foundry increased its output the building could be increased in length, and the cleaning equipment moved along to provide additional moulding space. With the growth of the plant in view, mills, grinders, and the sand blast machine were placed as far down as possible, that they need not be moved until the second extension to the foundry was made. The contour of the site was such that the waste material could be moved out of the side and end of the shop for filling purposes.

Owing to the peculiar location of the railroad tracks, the stock house was placed across one end of the building and the track was extended up to the charging floor, making it possible to unload several carloads of coke and iron on to this floor. The space underneath the trolley was utilised for the storage of iron, coke, sand, fluxing material, etc., and the whole was enclosed by a like building which contained a single rail electric traveller for handling material to the cupolas and the foundry, and which connected with the trolleys in the latter.

Main Building.

The main building was of steel frame construction, with brick curtain walls, and was provided with a wooden roof covered with slag roofing and with large, wooden-frame sliding sash windows. The floor of the foundry consisted of moulding sand laid on filling, although no pit work was done. Ventilators with tilting sash operated from the floor extended practically the width of the centre bay, and while there were no skylights, sidelights were depended upon for all of the illumination, the windows having been carried as high as possible for this purpose. Large galvanised iron ventilators were placed in the roof at every other bay to provide for the circulation of air when not pouring and in inclement weather.

The foundry was about 350 ft. long, and if it were increased in size to make other melting equipment necessary, the cupolas would be installed at one side sufficiently far down to conveniently distribute the iron according to the varying classes of work to be poured. It is not probable, however, that this will be done, as there seems to be no reasonable limit to the distance which a ladle of iron for heavy work can be carried.

Foundry for Machinery Castings.

A foundry of another type for the production of medium and large machinery castings, with a fair proportion of cored work, was laid out partly in accordance with the contour of the site on which it was located, due regard being given to the location of the railroad tracks. This foundry was of the usual three-bay type, having one large centre bay and two smaller ones on either side. The stock house was placed at one side of the property adjacent to the railroad track, and contained all of the raw materials except the iron, which was carried in the yard commanded by a crane. The stock house has an elevated track extending through it, that all supplies could be dumped by gravity from the cars in which they were received and thereafter conveyed under cover into the foundry. This stock house need not darken the side of the foundry which it adjoins, since it can be located far enough away to permit the placing of windows down to a level about 7 ft. above the floor, with a light well at least 12 ft. wide. In any event it makes little difference whether the light is somewhat obstructed on that side, since the melting equipment occupies some of it, and with a foundry for this class of work there are core ovens, drying ovens, sand mixers, core storage, core-making, and other departments which do not require much light, while others can be suitably lighted by skylights.

The coke is raised to the charging floors on cars by means of a plunger elevator, while the iron from the stock yard is carried by a single rail traveller directly on to the charging floor.

Both the melting and cleaning departments are fixed points in this scheme, the foundry with its stock house and yard growing away from these departments, and additional melting equipment can be placed in the side bay if required.

Cleaned castings are stored in a yard or building at right angles to the foundry, communicating with the machine shops. As there is considerable core work, a large amount of refuse has to be elevated by cheaply built conveyors to a set of overhead bins, discharging into cars or wagons.

Since a foundry of this type will have some pit work, the flooring will naturally

consist of sand to a considerable depth with brick or concrete floors in the cleaning department. The cleaning floor space will absorb some of the moulding room as the foundry is extended, but otherwise this department will not be disturbed.

This type of plant presupposes a large establishment divided into departments, castings being made at the option of the foundry rather than in response to some demand from the machine shops. This plant is to be built with masonry walls, having a wooden roof covered with slag or gravel, wooden window sash, partly sliding and partly tilting, large monitor with tilting sash, galvanised ventilators, core room partitions fire-proof, and with floors in front of the drying ovens and the core room of concrete construction.

Foundry for Chilled Castings.

Another type covering several classes of large work is designed to grow in two directions, being devoted to a large amount of chilled work. The melting equipment, including air furnaces, is located in the centre of the building, and the space immediately in front is occupied by the ladle and chill storage and ladle mending departments. Inasmuch as the moulds for the sections made in this plant are cast on end, a proportionately greater tonnage can be secured from a limited floor space, as compared with a plant where floor moulding is done exclusively. Considerable room is required in a shop of this kind for handling ladles. Separate power cranes are also required for each pit and liberal head room is necessary. The floor about the pits in front of the drying ovens should be made of concrete. The growth of the other end of the plant devoted to the production of general castings will be similar to that of the large foundry already described.

Arrangement of the Plant.

A plant of this kind may be divided into three or more bays, the furnaces being so located that they are accessible to the main bay cranes. The stock house and iron storage may be located as previously explained. The charging floor, on account of the cupolas necessary to supply all of the mixtures required, should be served by an overhead crane which can carry large pieces of scrap and carloads of pig-iron to any cupola or furnace.

While the area required per moulder in lighter grey iron work may be as great or even greater than in heavier work, the tonnage handled is proportionately much smaller. Frequently no overhead equipment is required, tracks or trucks being amply sufficient for handling the iron. Certain floors may require comparatively large amounts of iron and separate handling appliances, but, in general, the buildings will be divided into bays, with the melting done at one end or one side and the cleaning department directly opposite. The pickling department should be located away from the natural line of growth so that extensions will not disturb this department. For this class of work the core room can be established at a distance from the foundry, and it is not essential to have it directly in, or adjacent to, the foundry building.

The stock sheds and iron storage should, of course, be convenient to the melting department, and the overhead crane is not essential to the iron yard. Tracks and cars connecting with the elevator are as economical as a yard crane, when all of the handling is considered. A separate building should also be provided for the storage and repair of moulding machines.

In a foundry of this type it will be found necessary to install light overhead travellers, which can serve either the moulders or the machines, and which, in any event, can handle the iron. Considerable space is also necessary in a plant of this kind for stacking flasks, as it is not practical to have a large flask yard, or to build a separate structure for them. Galleries can be used very well as storage room.

Plants Equipped for Special Work.

Foundries equipped with machines for special work will next be considered. They can be built several stories in height with a foundry on the upper floor and the other departments underneath; or where there are a number of foundries in a group, the buildings should have two stories, with a foundry on the top floor. The various foundry buildings should be located so as to conveniently receive their supplies from one stock house and their cores from another, with a pattern storage and repair department over one or the other of these buildings. The buildings should be designed with sufficient head room in the lower story to accommodate large tumbling mills, with a platform over them for suitably distributing stock, the mills being high enough to dump their contents either into barrels or on to conveyors. A floor should also be provided for the foundry

with a frame for a suitable grating through which the sand can be dropped and on which castings can be piled after shaking out.

The roof should have sufficient strength to support travellers for carrying the moulds and iron, and all bracing should be kept above the trusses, as far as possible, to provide for conveyors for handling sand to the moulding machine hoppers. The trusses should be designed with a stiff lower chord, and should be of such form that the apparatus may be fastened to it anywhere without punching or drilling. A durable floor can be made of paving brick laid on planks with a cushion of sand, the planks having previously been covered with a waterproof material to prevent dry rot. A floor of this kind can be changed for any purpose more easily than one of steel or concrete, and is furthermore much lower in first cost.

The castings are dropped through chutes in the floor to the mills below, where the sorting, cleaning, and grinding are done, although a certain amount of sorting can be done on the foundry floor by judiciously locating the machines on similar work.

Continuous Work.

Plants for highly specialised work, involving carriers for handling moulds, flasks, castings, etc., will next be considered. There are two types, one with the building two or more stories in height, with a carrier on the upper floor, while the other has the carrier and the other departments on the ground floor. The price of the real estate and the size of the cores largely govern the design of a plant of this kind, as the output is large in volume and must be handled by conveyors, and there is little advantage in the use of gravity.

I have built plants of both types and have found either well suited for the work for which it was planned. In one case the core room and core storage were located so that the cores for all classes of work could be placed on the carrier with a minimum amount of handling, and each car of the carrier brought a fresh core to replace the one taken away. All departments, including the cleaning room, were on the ground level. Such a plant requires a large amount of light and ventilation, and windows and skylights are placed wherever possible. The floors are preferably of concrete, as practically no sand collects upon them, and as the pouring is done while the flasks are in motion on the carrier there is little danger of spilling or splashing iron. In another plant producing very small castings, the carrier was placed on the second floor, and the finished sections were delivered by means of a conveyor through a separator and cooling tank to a continuous cleaning apparatus on the first floor. The cores were handled in trays.

The roof of such a foundry should be very heavy and substantially braced in all directions, as it must support considerable overhead conveying apparatus for the handling of sand with concentrated loads at various points where the sand happens to be located. The floor should be of brick or concrete, preferably the former, for reasons which I have already given. There are no great floor loads with carriers, but a complicated flooring system is usually necessary on account of many conveying devices which are used. In the construction of buildings, brick walls, either with or without steel columns for supporting the trusses, have been used.

Types of Construction.

There are other forms of wall construction from which choice can be made, such as reinforced concrete, concrete plaster on wire laths, concrete blocks, terra-cotta hollow blocks, with or without steel reinforcing strips, brick, corrugated iron, and wood. The last two are rarely used at present, wood being objectionable on account of the fire risk, and corrugated iron in view of its short life. Of the other materials the question of relative cost is a large factor, and a suitable selection must be made to fit the case in hand.

I have always presented plans of all my buildings to the reinforced concrete contractors, that they might compete with the other forms of construction, but I have not yet been able to secure a bid or to have a building built as cheaply by them as from other materials, and when I say this I accord due appreciation to the question of insurance, as locality and contents are considered by the underwriters as well as the type of the building.

I am somewhat opposed to reinforced concrete on account of its lack of what I term "manufacturing elasticity," since it does not adapt itself very well to alterations and extensions which are constantly being made in plants devoted to foundry work. Brick, concrete blocks, and hollow tile are the most adaptable, brick probably being more so than any of the others. Considering the present

price of brick, no saving can be effected by the use of the other two forms of covering, although in the large foundries to which I refer the weight of the steel can be maintained at the minimum by the use of hollow tile above the windows.

For interior partitions hollow tile makes a firm, cheap wall. Concrete plaster on wire laths, expanded metal, or galvanised netting usually requires so much supporting steel that it is quite expensive and practically costs more than brick, and does not possess the advantages of the latter.

Steel roof trusses should be carefully designed, so that they may be conveniently reached with cleaning and paint brushes, especially in foundries of the continuous type, where considerable vapour arises from the cooling sand. The trusses and columns should be carefully and thoroughly painted. Roofs are cheaply constructed of wood, with slag or gravel covering. This covering is favoured in view of its low first cost, as against slate, tile, and special forms of reinforced concrete. I have had only one disastrous experience with a roof of this kind, and that was due to the fact that the sprinkler system had not yet been connected.

Windows, except where there is an exposure, are generally made with wooden frames, glazed with factory ribbed glass, and should be fitted to tilt, thereby securing the greatest possible opening. There was at one time a craze for making walls almost entirely of glass and steel. These buildings, however, are difficult to heat in winter and to ventilate in summer, while the glare of the direct sunlight is most unpleasant. Many plants of this kind have adjusted curtains to the windows, and in some cases large sections of glazed portions of the windows have been removed.

A building wall containing 50 per cent. of window space will usually be very completely lighted for any width of structure, and in any event, passages and storage departments can be placed in the darker sections.

I am an advocate of metallic bars and ribbed glass for skylights, and in continuous foundries, where a large amount of vapour is present, a copper bar is cheapest in the end.

All of the floors I have described have been used successfully, but there is one type that I have not referred to, and which is built of ordinary brick, with rails laid thereon, over which the flasks of the machines can be moved as the case may require. The rails should be laid down on sleepers in a sub-base of concrete, if this floor is on the ground level. The floors of the charging departments should be made of steel plates without tracks, or, in fact, any ridges of any kind to interfere with the free movement of trucks and the use of shovels or forks. The cupolas should be set fairly high, so that a man may work conveniently under them and to facilitate also the handling of ladles of various sizes. This is especially a desirable feature for continuous foundries where a ladle reservoir is provided with a skimming device, which is located between the cupola and the pouring ladle.

The charging door I usually make very large, with a heavy cast iron curb, that a truck of scrap or coke may be run right up to it and dumped in. The opening is best protected by a wire screen raised and lowered by counterweights. The installation of spark deflectors depends somewhat on the location.

I sincerely hope that someone will soon devise a practical cupola blast regulator. I have some ideas on the subject myself, but have been too busy to develop them.

Depending on the work, I advise from 11 ft. to 14 ft. above the tuyeres as the proper height of the opening in the cupola for economical and rapid melting. After considerable experience with tuyeres of various types, I still adhere to the old-fashioned square box tuyere as being the most reliable and efficient. Blowers vary in accordance with the service they are to render, my preference being for a positive blast blower for cupola work, with independent engine or motor, as circumstances may dictate. The motor should be provided with a speed regulator to control the melting, the latter being imperative for continuous practice. For air furnaces the centrifugal blower seems to be best adapted, a simple unloading device being sufficient for its regulation. It is, of course, needless to say that the larger the fan, within reasonable limits, the smaller the consumption of power.

I also advocate the slagging of the iron as the melting proceeds, and the tonnage of the heats will naturally indicate whether or not a special conveying apparatus should be used for handling this slag. A wheelbarrow is, of course, the simplest device.

Raw Materials.

The coke should be kept under cover and handled as little as possible. Scrap should be handled according to its nature,

as no single method will answer for all grades, although the magnet seems to be more adaptable than any other method. A system of handling pig-iron will depend upon the amount consumed. Small quantities for small cupolas which must be broken can be handled more cheaply by common labour, while large tonnages offer a prolific field for the use of a magnet, and add considerably to the storage space. I have yet to be convinced of the value of a cupola charging machine. Storage yards for charging materials should be served by an overhead crane, and industrial tracks should be used as little as possible.

Plunger elevators are best adapted for charging floor service. Whether the machine should operate directly by hydraulic pressure, or with some elastic medium interposed between the water and the source of power, will depend largely upon conditions. In large foundries, and especially for continuous work, I usually provide a speaking tube between the melter and the charging floor, that the chargers may supply coke in accordance with the demand for iron from the floor. From this you can see that the melting ratio is of comparatively little importance in this work, when compared with the cost of a completed mould. Frequently the core alone costs several times more than the coke employed in melting the iron.

Cranes.

For handling large flasks I prefer a locomotive crane, as it gives the greatest flexibility with the least expense. The practice of running an overhead crane through an opening in the end of the building is very expensive and unsatisfactory, requiring, as it does, expensive building construction. It is furthermore impossible to keep tight against the weather while the flask yard is limited to the space directly in line with the crane runway and generally in line with and obstructing the growth of the foundry. By the use of the locomotive crane a site of any shape can be utilised, and the crane can enter the foundry at almost any point. As it is operated by steam, it can be driven independently of the plant. For indoor flask storage, trucks and elevators provide suitable and convenient means for handling.

Belts of a liberal size with bucket elevators are best adapted for handling sand when it is to be delivered to the various parts of the foundry mechanically. Belts may safely be used for receiving hot sand dumped out of flasks, though containing many sprues, much shot, and chaplets. Belts also may be used for handling flasks in continuous work even though they are hot and of considerable weight. I also advocate sand riddles with bronze wire, as it lasts longer than iron, steel, or brass. Wood, or reinforced concrete, is the best material for sand hoppers, conveyor troughs, etc., while all the advantages are in favour of wood.

Continuous Systems.

In designing continuous systems, whether wholly or partly automatic, care should be taken to keep the various operations independent of each other that any interruption to any one may not affect the others. The efficiency of this method of producing castings depends largely on the care given to this feature. I have known of some who have failed entirely as a result of the too close adjustment of the various operations, whereas a little room between them would have made the plant a success.

Core rooms naturally depend on the nature of the work. For large and intricate work they should be located in the foundry, while others can be placed in separate buildings and can deliver the cores to the foundry on conveyors and can later be distributed by boys. For making cores of moderate size to be handled in dryers, I advocate that the benches should be so spaced that the oven cars can operate between them, permitting the finished cores to be placed directly on the cars, and when filled they can be run directly to the ovens over suitable tracks. After the cores are baked, the cars can be delivered to the core storage room, thus obviating unnecessary handling.

For cores of large or moderate size, I prefer an oven which has a long arch at the bottom with fire and combustion chambers underneath, and the heat thus radiated. will circulate through every part of the chamber. For small cores I had devised an oven heated by oil or gas containing a conveyor. Learning later that the same could not be patented, owing to a previous right on a continuous baking machine, I lost interest in the same. A plant which I built has eight of these in operation, using oil in conjunction with waste heat from the malleable annealing ovens.

When cranes and tracks are used, care should be taken to prevent points of congestion at meeting or transfer places.

SOUND CASTINGS.*

By David Spence.

There is at present a great demand for castings for printing machinery and tools, and being actively engaged in that line, I have made an effort to develop details in practice which have given most excellent results. Thus the matter of a little gate enables me to get out castings of printers' rolls clean and sound, with no loss, while formerly the percentage was very high.

When I first worked in the foundry the method in vogue provided for the use of a storage catcher on the mould, and to run castings with a small gate using a large basin to hold the iron. This was very good. Later came the needle sprue system, which was a step far in advance of the old way of bringing the work sound and clean.

Now that we have a variety of patent gates, each good in its way, we can get printers' rolls and gear blanks as sound and clean in green sand as if made in loam or dry sand.

While in Chicago, I called on a firm using many gear blanks and was asked to guarantee the defective work down to 5 per cent. I did it, and out of an order of 300 gear blanks of various dimensions, less than 5 per cent. were defective. These were all made by running them on the hub, with four small spindle gates and a large basin running across the flask. The iron used was hot and fluid. I always advise the use of iron not too hot nor too dull, but preferably the hot. The moulder has his part to play also to get good sound castings. That part is to make a good clean mould, well vented, so that the removal of the gases may be readily accomplished. The moulding sand should be good and open, and not too much loam in it.

For facing for printers' and laundry rolls, I use five parts moulding sand, one part fire sand, and one part of sea coal with a little flour. This all mixed together and dampened with stale beer or molasses water gives fine results.

The iron used should be low in sulphur, close grained, and a small percentage of car wheel scrap should be added, as well as high silicon iron to insure the proper softness. The middle of the heat is where I prefer to take the iron for this special work.

For the last twenty-five years I have given considerable thought to the subject of mixing iron for foundry work, and must say that at our conventions I have always found some valuable points along these lines. We are doing much in this quiet way for the thinking man of the foundry, and I need not tell you that we need thinking men in this industry, as well as in any other branch of manufacture.

* Paper read before the American Foundrymen's Association.

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SMALL THINGS OFTEN NEGLECTED IN THE CORE ROOM.*

By H. M. Lane.

In too many foundries the core room is either considered a necessary evil, or is looked upon with such contempt that it is simply allowed to shift along any old way that it can. Core makers are too frequently ignorant of the real reasons or principles underlying their trade, and do not understand or appreciate the advantages of different binders, different methods of making cores, etc.

No universal rules can be laid down for governing the core room and its conditions, as the quality of sand available and the character of the work will, to a large extent, determine the most efficient method of carrying on the work.

In some cases a local sand of poor quality can be used to produce cores at a lower price than they can be produced by shipping in sand of a better grade, providing the proper binder is selected and the proper amount used.

It is just as bad core practice to use too much binder as it is to use an insufficient quantity, and there is no universal binder which will fit all cases.

Binders.

For cores which are to be kept in stock for some time, a binder must be selected which will not draw or absorb dampness, or else the storage room must be kept at such a temperature and under such conditions that it will keep the cores dry. One may find that he can use flour or molasses to advantage, and then arrange his storage room so that it is heated with stoves, or waste heat from the ovens, by locating the storage rooms over the ovens. Another may find that it is cheaper to use resin, oil or some compound which does not absorb moisture, such as one of the dry mixtures now on the market. All of these conditions must be carefully considered when selecting a core binder.

* Paper read before the American Foundrymen's Association.

It is exceedingly easy to fool not only the boss, but yourself in experiments conducted to determine the best binder. Some of the points to be considered are the cost of the sand, the cost of the binder, whether the use of a given binder makes it more or less difficult to make the core, what effect it has on the drying, what effect it has on the storing and what effect it has on the percentage of castings lost. Some binders are very satisfactory for light cores, but totally unsuited for use in heavy cores. Then, on the other hand, one core maker will make heavy cores with a given binder which are as perfect as anyone could desire, while another will fail utterly, on account of the fact that he does not understand how to open up or vent the interior of his core with the use of coke, wax strings or other devices.

Core Machines.

In cases where a large number of stock cores are employed, there is more of a chance for saving than there is in a general jobbing foundry. In the first place, the cores having a uniform cross-section, whether it be circular, rectangular or of any form such as a section of an oval, can be made to advantage on a core machine of the sausage stuffing type—that is, a machine which feeds the material out in a continuous stream by means of screws.

For exceedingly small cores—that is, below $\frac{3}{8}$ in. in diameter—special machines have been devised which make cores by a combined screw feed and plunger feed.

The cores which can be turned out the cheapest by machinery are the medium-sized cylinder core or prismatic forms.

In steel foundries and other establishments using a large number of covering cores, the slab core machine will be found a decided money saver.

The multiple spindle core machine will also be found advantageous where a large number of cores of uniform size or character are required.

For irregular cores of small size which are required in large quantities for pipe fittings, hardware, valves, small machine parts, etc., all metal core boxes should be used, and a mixture employed which requires but little ramming. A core mixture made with oil and sand can be rammed by simply jarring the core box on the bench. Where wires are required in cores of this kind, care should be taken to see that they are so located that they can be easily removed from the castings during the cleaning process. Ordinary wire, such as can be purchased on the market, is not well suited for core wire. A soft or annealed wire is too soft, while the hard drawn wire is too hard and brittle. Where only a comparatively small amount is used, it is well to use soft iron wire, but before using, the wire should be stretched a certain amount to harden it. A handy device for this purpose can be made by arranging the wire so that it can be clamped at one end, and then providing some drawing mechanism, about 6 feet from the clamp which will stretch the wire from 3 to 4 in. in 6 feet. The drawing device can be in the form of a lever carrying a clamp, or it can be a rack and pinion. This stretching of the wire greatly increases its stiffness, and enables it to hold up or support the core much better.

There is at least one wire mill in the country, however, that understands the core room conditions perfectly and can furnish wire which has been drawn to just the proper degree of hardness, and when large quantities are required it will pay any foundry to buy such specially drawn wire.

Metal Core Boxes.

Metal core boxes for constant use, and especially when of small size, should be made of a high grade pattern bronze, as this will not tarnish or corrode and is of such a character that the core leaves the box freely. The designating numbers or marks upon the box should be so located, that the thumb or fingers will be rubbed over them when the box is in use, as this will keep a bright spot where the mark is located, which will always make it easy to see. If the mark is located on some other part of the box, it is liable to become gummed up so that the number is difficult to read.

One point that many core makers do not give proper attention to, is the amount of moisture used in tempering sand. Sand should always be worked as dry as possible, for every pound of moisture introduced must be evaporated in the core oven. The evaporation of this moisture takes fuel and costs money, hence the use of an excess should be carefully avoided. Machine made cores have one decided advantage over hand made product, and that is that the mixture may be worked much dryer in the machine than by hand—in fact, only about half the water is required in the machine-made cores.

Testing Cores.

In testing machine-made cores, to see whether or not they have been properly

baked, there is a simple device which can be used. This consists in the introduction of a bright steel wire, such as a machine vent wire, into the hole in the end of the core. If the core is thoroughly baked, the wire will come out dry, but if the core contains any moisture, the wire will be moist when it is withdrawn.

It is in the making of the little cores which are used in large quantities that the biggest saving can be effected in the average foundry. It is easier to cut the cost of these cores in two than it is to make the like percentage of saving in the production of the large cores, and hence the up-to-date foundry superintendent should give especial attention to the best method for turning out the small and medium-sized cores.

In attacking the problem of how to reduce the core expense, one of the first things to be considered is the best method of making the core. The first factor to be considered in this point is the number of cores to be produced, and next their form. If the number is very great and the form regular they can be produced on a standard core machine, and it pays in all cases where it is possible to standardise the cores. If the number is great and the forms are irregular they may in some cases be made on a standard machine, but subsequently cut, formed or pressed in suitable dies; but in most cases it will be necessary to use specially formed metal core boxes.

Core Room Methods.

To further reduce the cost, the arrangement of work in the core room should be carefully considered and systematised as far as possible. In a large core room, the core maker should never have to leave the bench at which he works, but should be supplied with properly prepared sand, and should have all of the cores removed as fast as they are completed and carried to the oven. After the cores are baked they should be passed to the foundry or to storage, by some one who makes that his especial duty.

Baking Cores.

The matter of drying or baking cores is exceedingly important. Some cores require a very much higher heat than others. Where a binder like flour is used, it is necessary to actually bake the flour, and hence the temperature must be at least that used for baking bread. If the core is intended for steel castings and it is considered necessary that it be rotten in texture, a sufficiently high temperature must be used, to practically burn the binding material.

Where one of the dry binders made from pitch or resin is used, a sufficient temperature is required to render the binder fluid so it will flow through the body of the core and thoroughly unite the particles of sand. In the case of resin or pitch binders, some of the volatile products of the resin or pitch are driven out during drying, but this is not an important factor in the reaction which takes place.

In using molasses or flour, the process of drying is, first, one of the evaporation of moisture, and second, of a baking or changing of the bonding material. In the case of oil binders, the baking process is essentially an oxidation process. A linseed oil core will harden at atmospheric temperature if allowed a sufficient length of time. Linseed oil is the basis of most paint, and paint hardens by the oxidation of the oil. The process which takes place in an oil core is very similar indeed. The baking of an oil core is simply a hastening of this oxidation process.

In any core baking process there is considerable moisture to be removed as well as the chemical reactions to be brought about, and hence a good circulation of air in the core ovens is highly essential.

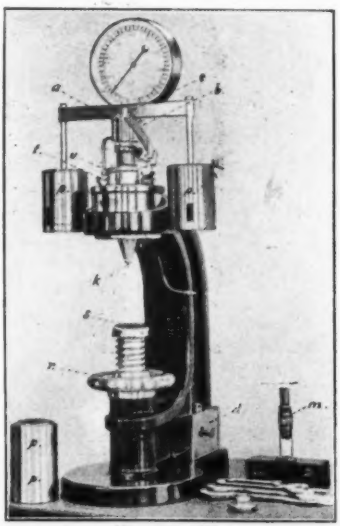
The thermal or heat efficiency of core ovens could be very greatly increased if the waste heat of the ovens was used for partially drying the cores. This has been done in some foundries, the truck of cores being run into one oven where they are dried, and then to another where they are baked. Where this is done one point requires careful attention, and that is to be sure no attempt is made to dry cores beyond the point where the hot air escaping from the oven is saturated with moisture or has reached what is commonly known as the dew point.

The fuel to be used in drying cores has an important bearing on this subject. While natural gas forms a very fine fuel for many purposes, it would not form an ideal fuel for this last-mentioned system for drying and then baking cores, on account of the fact that one of the principal products of combustion of natural gas is water, which condenses into steam, as the gas contains a very large amount of hydrogen. Coke forms an ideal core oven fuel, as the products of combustion contain practically no moisture, and hence have the greatest drying power.

BRINELL'S METHOD FOR TESTING THE HARDNESS OF METALS.*

By J. E. Stead and T. Greville-Jones.

The method of testing the hardness of metals, elaborated by Professor Brinell, has received very favourable notice and attention from metallurgists in this as well as in other countries. It was first described by Mr. Axel Wahlberg in a paper read before the Iron and Steel Institute in 1901.



Machine for Testing Hardness of Metals.

In principle, the method consists of forcing a hard steel ball into the material to be tested under a definite pressure, measuring the diameter of the impression, and, from the diameter, calculating the spherical area of the concavity, the Brinell hardness number being obtained by dividing the maximum pressure into the area so found. The steel ball recommended by the inventor is one exactly 10 mm. in diameter.

Mr. Sandberg and other engineers have for some time applied the method for determining the hardness of rails with satisfactory results.

In the test as employed by Mr. Sandberg, the impression is made on the head of rails by forcing a steel ball 19 mm. in diameter into the steel under a pressure of 50 tons. The record of the hardness is obtained by calculating the volume of the steel displaced by the ball, and this is based on the depth, and not on the diameter of the impression. As it is important to be able to correlate the Sandberg and Brinell hardness numbers, Mr. A. H. Cooper has drawn up tables which enable this to be done, for whilst in the Brinell numbers the hardness increases with the numbers, in Sandberg's method of stating his results the reverse is the case. This condition of things is liable to lead to confusion, for a high Sandberg number indicates softness, whilst a high Brinell number indicates hardness.

The method of applying the test was at first only possible to those who had tensile testing machines. Quite recently a firm in Stockholm—The Aktiebolaget Alpha—has designed and placed on the market a compact, neat and trustworthy machine, specially arranged to make Brinell hardness tests.

The machine, illustrated herewith, consists of a hydraulic press acting downwards, the lower part of the piston being fitted with a 10 mm. steel ball *k*, by means of which the impression is made on the surface of the specimen or object to be tested. The sample is placed on the support *s*.

The pressure is produced by means of a small hand pump, and is recorded on a pressure gauge.

In order to render the motion of the piston quite frictionless, packings are dispensed with, for, as the piston is so accurately fitted, they are unnecessary.

Any small quantity of fluid escaping is collected by means of a pipe conduit in a receptacle *d*, at the foot of the stand, whence it is poured through the funnel *t*, to the oil reservoir.

The controlling apparatus consists of a smaller cylinder, directly communicating with the main cylinder, which is furnished with a frictionless piston. When this is loaded with weights corresponding to the amount of pressure required, the piston is pushed upwards by the force within the larger cylinder at the very moment when the required pressure is attained.

With every machine is supplied a complete set of weights corresponding to the respective pressures.

* From the "Proceedings" of the Cleveland Institution of Engineers.

Mode of Performing the Ball Test.

A test specimen must be properly polished on the place where the impression is to be made, and then be placed on the support *s*, which is raised by means of the hand-wheel *r* until it comes into contact with the ball *k*. On then closing the valve *v*, which cuts off communication between the press cylinder and the oil cistern, and applying a few rather slow strokes with the hand pump, the pressure needed to force the ball downwards will be produced, thereby causing a slight impression in the sample of metal. As soon as the requisite pressure is attained, the upper piston with the controlling apparatus is forced upwards, whilst the corresponding pressure is indicated by the manometer or gauge.

On testing specimens of iron or steel, the pressure must be maintained for 15 seconds, but in the case of softer material, during about half a minute. After the impression is made the pressure is removed, and the sample at the same time released by re-opening the valve *v* and lowering the support *s*. The diameter of the impression produced by the ball is then measured, and the corresponding hardness numeral looked for in the table.

The best way of measuring the diameter of the depression is by using the microscope *m*, which is specially made for that purpose, and which gives results accurate to within $\frac{1}{20}$ millimetre.

Mr. Brinell claims that this method offers a most ready and convenient means of ascertaining the ultimate stress in iron and steel. To do this it was necessary to find coefficient constants by which to multiply the hardness number, so as to obtain the corresponding tenacity.

Dillner's coefficients are as follows :—

	Kilos. per sq. mm.	Tons per sq. inch.
(*a*) Hardness numeral below 175.		
Impression made transversely to rolling direction ... Coefficient	0.362	= 0.230
Impression made in rolling direction ... ... Coefficient	0.354	= 0.225
(*b*) Hardness numeral above 175.		
Impression made transversely to rolling direction ... Coefficient	0.344	= 0.219
Impression made in rolling direction ... ... Coefficient	0.324	= 0.206

For instance, in a case of testing annealed steel bar by means of the Brinell ball test applied to one of the surfaces, when the diameter of impression was 4.6 mm., then the hardness numeral according to the table is 170, and the ultimate stress $0.362 \times 170 = 61.5$ kilogrammes per square millimetre, or $0.230 \times 170 = 39.1$ tons per square inch.

Brinell Hardness Number of Cleveland and Other Irons, etc.

A series of Clarence pigs and foundry castings were tested in the machine with the following result :—

Clarence Pig-Iron.

Pressure ... ... 3,000 kilos.
Diameter of ball .. 10 mm.

		Hardness number.
Glazed iron ...	average hardness	= 143
No. 1	,, ,,	= 104
No. 3	,, ,,	= 112
No. 4 foundry ...	,, ,,	= 156
No. 4 forge ...	,, ,,	= 160
Hard forge ...	,, ,,	= 197
Grey mottled ...	,, ,,	= 153
White iron ...	,, ,,	= 418

Foundry Mixtures.

Fracture.	Brinell's hardness number.
No. 4 foundry	131
Do.	143
Do.	143
Do.	153
No. 4 forge	170
Do.	187
Broken cylinder from a Clement motor car engine	207

The above results show that whilst No. 1 is the softest, glazed iron, which may be regarded as a higher number than No. 1, approximates in hardness to No. 4 foundry; they also confirm what is well known, that generally, as the number of fracture rises the hardness increases. The softness of the mottled iron must, we think, be regarded as exceptional.

Other Metals.

Spiegeleisen 10% Mn	782
Chilled castings=Hard face	445
,, ,, Middle mottled ..	350
,, ,, Grey back	207
Hardened steel file	560
Horse-shoe magnet=Magnetised part	512
,, ,, Soft part	207
Rail steels, 0.4 to 0.45...	200 to 210
Tinplate bars, 0.1% C...	112
Purest Swedish iron...	87

Spiegeleisen is very hard but easily fractures along the cleavages of the carbide plates.

Swedish iron containing 99.80 per cent. iron and 0.03 per cent. carbon is the softest of the series.

There can be no doubt that this machine can be usefully applied in many directions, and more particularly in the foundry and engineering shops.

The test is so quickly made and the specimens so easily prepared that the method of testing is certain to appeal to practical men.

Whether or not the tenacity given by calculation based on the hardness number can be depended on for different classes of material remains to be seen.

AMERICAN STEEL CASTING INDUSTRY.

No branch of the foundry industry has experienced a greater growth in the last decade than the manufacture of steel castings, and notwithstanding the marked development in the past few years, the number of plants projected and under construction foreshadows expansion unparalleled in the history of the trade.

This growth is largely due to the substitution of steel castings for iron and forged sections.

The successful adaptation of the green sand mould has been a potent factor in the forward movement of this industry, having entirely eliminated the expense of drying in ovens with its attendant danger of breaking down the moulds by repeated handling. The perfection of the basic process has likewise contributed to this cost reduction, but while big gains have been made in the output of furnaces with basic linings, the production of acid castings still leads by a wide margin. In the west, notably the St. Louis district, the basic process has reached its highest state of efficiency, while in the east the acid process is still in its ascendancy.

The accessibility of the basic irons of the south has largely influenced the development of the basic steel casting industry in the west and south-west, whereas the manufacturers in the east have an abundant supply of low phosphorus and Bessemer iron.

The annual output of basic castings in the St. Louis district now reaches a total of 150,000 tons, only three works contributing. The foundry operated by the Scullin-Gallagher Iron and Steel Company is the largest plant of its kind in the world. Its equipment consists of eight open-hearth furnaces and two converters. The other two foundries in this section are operated by the Commonwealth Steel Company and the American Steel Foundries.

Within six years the production of steel castings has increased over 500,000 tons. In 1900 the total output of Bessemer, open-hearth, and crucible castings amounted to only 192,803 tons, as compared with 713,157 tons of basic and acid castings alone in 1906.

The growth of the industry in the last nine years is best shown by the following figures :—

	Tons.
1898	171,937
1899	181,112
1900	192,803
1901	317,570
1902	390,935
1903	430,265
1904	330,211
1905	560,767
Basic and open hearth castings only.	
1906	713,157

Although figures are not available, the output of crucible castings in 1906 will be within 7,000 tons. The manufacture of castings by this process has also shown a slight increase from year to year. The production of converter steel castings in 1905 was 22,103 tons, as compared with 6,784 in 1901. The estimate for 1906 is well above 25,000 tons.—"Iron Trade Review."

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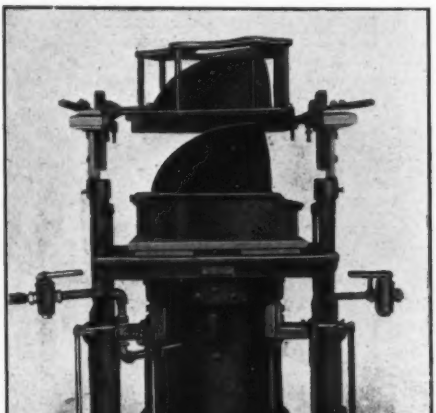
THE HERMAN JARRING MOULDING MACHINE.

The name given the machine shown in the illustration, the Herman jarring moulding machine, describes in brief the manner in which the sand is packed about the pattern, that is, by jarring the flask. In connection with the machine illustrated, which is manufactured by the Herman Pneumatic Machine Company, Zelienople, Pa., there is shown an improved form of turnover for revolving the flask before the drawing of the pattern.

The pattern is fastened in the frame shown at the top of the machine, which is suspended by trunnions, allowing it to be revolved. At the beginning of operations this turnover, as it is called, is placed in inverted position to that illustrated, and rests upon the table plate. The pattern is then fastened to the turnover, and the flask is placed over it and filled with sand. By opening an air valve the jarring device is set in action, and the mould receives from 10 to 50 jars, or as many as may be necessary to sufficiently pack the sand. This manner of ramming is claimed to have the advantage of almost certainly precluding swells and scabs. The sand is jarred uniformly, and is packed most densely around the pattern, while the top is less compressed, and being therefore more porous, allows easy escape of the gases. After the ramming is completed the sand is struck off and the follow board is clamped to the flask. Pneumatic lifters are then operated, which raise the turnover plate high enough to

allow it to be revolved, when it is again lowered on the table plate of the machine. The clamps are then removed, lifting forks are placed under the turnover plate, and through the pneumatic hoists which are attached to the side of the machine the pattern is drawn from the sand. The mould is then ready to be placed on the floor. To repeat the operation the lifting forks are disengaged, the pattern is turned over to its former position, and the air is released, allowing the turnover plate to descend to the table ready to



THE HERMAN JARRING MOULDING MACHINE.

receive the next flask. The turnover device can, when desired, be easily removed, and patterns, with stripping plates, can be used on the same machine.

The machine is claimed to ram up an average mould in less than one minute, and to give duplicate castings which will vary in weight much less than if they were made in flasks rammed by hand. The time required to place the sand in the flask and remove the flask to the floor depends upon the facilities afforded by the equipment installed, and upon the energy, and to a less extent the skill, of the man operating the machine.—"Iron Age."

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MESSRS. P. SANDFORD & SON have removed to 57, Gracechurch Street, London, E.C.

THE SHEELER-HEMSHER IMPROVED CRUCIBLE FURNACE.*

THE development of the Sheeler-Hemsher furnace for melting brass and other metals was entirely due to the force of necessity, the mother of invention. In regular practice we had been using in our foundry furnaces of the natural draft type, having an 80 ft. stack, 3 ft. in diameter. The stack should have given enough draft, and did at times, but right here is where the difficulty was experienced, the draft could not be depended upon, and heats were in some cases delayed for hours, which any one will admit is a first-class means of eating up profits. We found a loss in oxidation as high as 7 per cent. on red metal alone, and at times it was necessary to have our furnacemen begin as early as 5.30 in the morning in order to have the metal ready for the first pouring.

A Forced Draft Furnace Decided Upon.

Considerable thought was given to the development of a furnace which could be depended upon, and which would be as simple as possible, one without complicated mechanical features, and one that could be built at a minimum cost, with low fuel expense, and a reduction in the loss by oxidation. The result was the Sheeler-Hemsher forced draft crucible furnace, using a combination of coal and coke for fuel. This type of furnace has been in successful operation in our own foundry, as well as in a number of other foundries, for several years. In this furnace a number of the old natural draft furnace principles have been retained, while a number of new features have been added, and we have a furnace without any unnecessary mechanical accessories which often look well and argue well, but fail to produce the desired result.

The reduction of fuel costs, the saving of time in melting and the low percentage of loss by oxidation have been proved by actual practice. The contention of many that blacklead crucibles suffer greatly under forced draft does not seem to be borne out by our experience with this furnace. In fact, we have been able to get almost regularly from 30 to 35 heats each from several of the leading makes of crucibles.

Description of the Furnace.

The Sheeler-Hemsher furnace can be built to accommodate any size of crucible.

* Paper read by J. H. Sheeler, before the Philadelphia Foundrymen's Association, May 1.

Those in general service take in a No. 70 without difficulty. This size furnace measures approximately 27 in. in height, and consists of two ⅜-in. boiler iron shells, 18 and 9 in. in height, respectively, and 26 in. in diameter, bolted together, making two sections and lined with fire-brick stood on end. The upper section is made so that it can readily be removed from the lower one by a tee-iron connection, that serves to hold the fire-brick lining of the shell in position, as well as forming a guide and clamp to hold the lower section in position, which rests directly on the ash pit or air chamber. The advantage gained in making this furnace in two sections is that it permits of repairs to either the upper or lower sections independently, without the necessity of relining the entire furnace. The ability to do this as often as the lining of the lower or firebox section cuts out to any appreciable degree is not only the matter of reducing the costs of repairs, but in that it enables the operator to reduce the area of the firebox, due to the cutting of the lining, and thus the consumption of an excessive amount of fuel, due to the increased size of the firebox, is avoided. This makes quite an important saving in the item of fuel expense, as it has been demonstrated from actual experience that the lining of the upper section of the furnace will last about four times as long as the lower one. The saving in repair work, by lining one section at a time, is, therefore, obvious.

The ash pit or air chamber of the furnace is rectangular in shape, 39 in. long, 27 in. wide, and 12 in. deep, with the usual door for cleaning out the ashes, etc., mudded up in the regular manner when the furnace is in operation. The top of the ash pit consists of a cast iron plate, with a raised rim, which holds the furnace in position. The firebox extends about 8 in. in front of the furnace, and the inlet of the blast into the firebox is through a 3-in. pipe, located in the upper portion of this extended section, the air blowing directly downward into the pit. The grate bars are 1 in. square, and are carried in a sling just under the firebox. The furnace tops, or covers, are cast iron, and semicircular in shape, made in two sections, with an opening in the centre, 11 in. in diameter, in order to hold a worn-out crucible, with the bottom removed, so as to act as a funnel in charging. When the funnel is not in use it is covered in turn by a small separate cast iron cover that can be easily shifted and allow the melter to get at the pot for stirring, etc., without removing the entire cover.

Pressure of the Blast Used.

The blast used in connection with a Sheeler-Hemsher furnace should be at a pressure of from 1 to 1½ ozs. In our foundry, where a battery of eight furnaces is installed, the pressure is supplied by a No. ½ Baker pressure blower, giving 13 ozs. pressure when all the gates are closed. A 6-in. blast main carries the air to the furnaces, and the average pressure per furnace is about 1 oz.

Some records as to the working and fuel cost on these furnaces made in our own plant are as follows:—

Recently 200 lbs. of copper in the shape of sheet clippings and chunks was run down and poured into castings in 60 minutes. A No. 70 crucible was used, and the fuel consisted of 36 lbs. of coal and 46 lbs. of coke, the fuel cost per 100 lbs. of metal being 11 cents.

Again, 180 lbs. of bronze scrap was run down ready for pouring in 45 minutes, the fuel consumption being 24 lbs. of coal and 24 lbs. of coke, the cost of fuel being 8 1-3 cents per 100 lbs. of metal.

Again, 100 lbs. of yellow brass punchings was melted ready for pouring in 35 minutes, using 20 lbs. of coal and 24 lbs. of coke, or a cost of 6 2-3 cents per 100 lbs. of metal.

As an experiment, 180 lbs. of pig-iron, broken in small pieces, was run down in this furnace in 1¾ hours, pouring a clean and perfect casting. No fuel account was kept against this heat, as it was not done to test the question of economy, but the ability of the furnace to develop the necessary heat to melt the charge in a reasonable time.

In all the above tests the loss of metal by oxidation was extremely low. In three separate tests in running down red brass turnings or chips the loss in each case was 1½ per cent. In running down copper ingot we were unable to determine any loss. In running down copper gates and wire the loss was 10 ozs. to the 100 lbs., and part of this was no doubt sand that adhered to the gates. With 100 lbs. of yellow brass ingot, gates, etc., run down in 40 minutes, the loss was ¾ lb. of metal, using 24 lbs. of coke and 20 lbs. of coal.

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The machine tools, etc., at the Atlas Machine Tool and Steam Motor Wagon Building Works, Levenshulme, Manchester will be offered for sale by public auction on July 10 and 11.

BRASS CASTING REGULATIONS.

THE Home Office has issued a draft of Regulations relating to the above subject. It will be observed from the regulations which are given below that the chief proposal in the Regulations is the requirement of efficient means to remove the fumes which arise in the process of pouring the brass. These fumes are the chief source of injury to health among those engaged in the casting shops. Great advance has been made in recent years in the direction of the local application of exhaust ventilation for the purpose of the removal of fumes, and it has been found that in other industries, where Regulations similar to those now proposed for the brass trade are already in force, they have been productive of beneficial results.

The second of the Regulations prescribes in detail the nature of the washing accommodation to be provided for the use of persons engaged in the casting of brass. The inspectors have found that in many cases the washing conveniences provided under the existing Special Rules are extremely inadequate and unsatisfactory, and some amendment of the rule has therefore become necessary. It will be observed that the requirement as to limewashing in the Special Rules has been dropped. The Act already requires limewashing to be done at least once in every fourteen months.

In accordance with the requirements of the Factory and Workshop Act, 1901, the Regulations are now issued in draft and are subject to further consideration. If objections of substance are taken to them either by the occupiers or the workpeople, or by any other persons affected, these objections will, under the statute, be the subject of full inquiry by a competent person appointed by the Secretary of State, and the report of the person holding the inquiry will be considered by the Secretary of State before the final Regulations are made. At the enquiry employers, owners, occupiers, and workpeople, and all others concerned, will be entitled to a full hearing.

If, therefore, any person desires the Regulations to be further considered, he should lodge objection in accordance with Section 80 of the Factory and Workshop Act, 1901. The draft Regulations follow :—

Regulations for the Casting of Brass.

Whereas the casting of brass or any alloy of copper with zinc has been certified in pursuance of Section 79 of the Factory and Workshop Act to be dangerous, I hereby in pursuance of the powers conferred on me by that Act make the following Regulations, and direct that they shall apply to all factories in which the casting of brass is carried on. In these Regulations, "brass" means any alloy of copper with zinc. "Employed" means employed in the casting of brass. It shall be the duty of the occupier to observe Part I. of these Regulations. It shall be the duty of all persons employed to observe Part II. of these Regulations.

PART I.

DUTIES OF OCCUPIERS.

1. Pouring of brass shall not be carried on unless there be :—(*a*) An efficient exhaust draught for the removal of the fumes at or as near as possible to the point of origin; and (*b*) efficient arrangements to prevent the fumes from entering any room in the factory in which work is carried on; and (*c*) free openings to the outside air in the upper part of the room.

2. There shall be provided and maintained in a cleanly state and in good repair, for the use of all persons employed, a lavatory, under cover, with (1) a sufficient supply of clean towels, renewed daily, and of soap and nail brushes, and (2) with either (*a*) a trough with a smooth impervious surface, fitted with a waste pipe without plug, and of such length as to allow at least 2 ft. for every five such persons, and having a constant supply of warm water from taps or jets above the trough at intervals of not more than 2 ft; or (*b*) at least one lavatory basin for every five such persons, fitted with a waste pipe and plug or placed in a trough having a waste pipe, and having either a constant supply of hot and cold water, or warm water, laid on, or (if a constant supply of heated water be not reasonably practicable) a constant supply of cold water laid on and a supply of hot water always at hand when required for use by persons employed.

3. No female shall be allowed to work, in any process whatever, in any room in which pouring of brass is carried on.

PART II.

DUTIES OF PERSONS EMPLOYED.

4. No person employed shall leave the premises or partake of food without carefully washing the hands.

5. No persons employed shall carry on the pouring of brass without using the apparatus provided in pursuance of Regulation 1 (*a*).

LIST OF NEW INVENTIONS.

Specially compiled for THE FOUNDRY TRADE JOURNAL by MR. GEORGE BARKER, Fellow of the Chartered Institute of Patent Agents, Consulting Engineer and Chartered Patent Agent, 77, Colmore Row, BIRMINGHAM.

1907.

8,872. A. MENZIES. Improvements in double-acting air pumps.

9,098. R. H. BARNWELL. Improved air-compressing or pumping apparatus.

9,237. W. O'KEEFE. Improvements relating to machines for use in drawing patterns in moulding.

9,420. P. L. O'TOOLE. Moulding machines.

9,456. A. J. BOULT. Improvements in or relating to sand moulding.

9,457. A. J. BOULT. Improvements in or relating to moulding.

9,638. T. BIRD. Machine for casting and conveying molten steel or iron direct from the furnace as a hollow bloom in cylindrical or other form.

9,846. F. ZAGELMEYER. Improvements in the process or method of making moulded building blocks or bricks.

9,875. R. RHODES. Improvements in spelter melting pots or baths.

10,081. S. H. ADAMS. Improvements in pumps, air compressors, engines and the like.

10,558. A. C. ROESSLER. Improvements in and relating to fluid compressors.

10,565. G. WILSON. Improvements in the arrangement and construction of rotary engines, pumps and the like.

10,885. G. CHESTER. Improvements in centrifugal fans and pumps.

ABRIDGMENT.

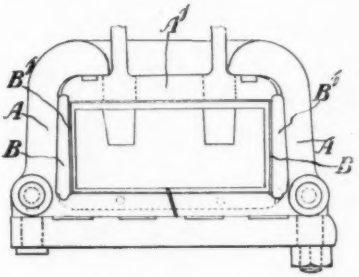
1906.

6,112. J. G. STIDDER, London. Improvements in machines for moulding plastic or like substances.

This invention relates to moulding and pressing machines of that type in which the plunger works against a fixed floor in the mould. The object of the invention is to improve the construction of the moulds for the purpose of combining therewith removable liners, such as are employed in some cases with moulds where the pressing plunger works against an ejecting plunger, forming the other side or base of the mould. The improved construction will facilitate the moulding of articles of different pattern or shape, or of articles having ornamentation, grooves, recesses, or projections in or on their faces.

By the use of the improved construction and by forming the desired ornamentation on the liners, patterns of any kind can be formed upon the side faces of the article, and if ornamentation is required on the other side or sides, the plunger is suitably ornamented on its face. The joints between the liner and the mould will preferably be taper, although they may be parallel if required, and the moulding faces of the liner may be inclined in any suitable manner as long as the joints on which the liners slide when ejected are arranged to effectually release the liner together with the moulded piece.

As seen in the figure, the sides A of the mould are provided with liners B, the



inner faces of which may be formed so as to produce the desired ornament. These liners are preferably recessed into the sliding wall A^1, and are adapted to be removed with the moulded article whereby the faces of the blocks are prevented from becoming damaged. The liners B may have an inclined outer face B^1 adapted to co-operate with a correspondingly formed face upon the side walls A of the mould, whereby only a slight ejecting movement serves to loosen the liners B and the article from contact with the outer walls of the mould.

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BRADLEY & CRAVEN, LIMITED, Westgate Common Foundry, Wakefield, are supplying two of their 36 in. by 6 ft. stroke Corliss winding engines, together with steel winding drum 16 ft. diameter by 7 ft. wide on the rope path, for the collieries of the Right Hon. Earl Fitzwilliam, at Elsecar, near Barnsley.

CORE TRANSPORATION IN A FOUNDRY.

MR. H. M. LANE describes in the "Iron Age" a compact system of core transportation. He points out that in a large plant the transporting of finished or baked cores from the store-room or from before the core oven to the foundry floor is a problem which requires careful consideration. When an attempt is made to transport cores on any form of floor railroad the jarring of the trucks or cars in passing over the track is liable to break or injure the cores, and in a foundry it is practically impossible to keep the track clean so that the cars will run smoothly. Then, too, the tracks are required for many other purposes, and cannot be tied up in the transportation of cores.

A very neat device for overcoming this difficulty is shown in the accompanying illustration. A core carrier is suspended in the core storage department, and loaded by a workman with plates of cores. The carrier is a light pipe structure supported from an overhead trolley by spiral springs. Sufficient elasticity is thus secured so that there is no danger of the cores being broken by being jarred or shaken during transportation. The cut shows the core carrier after its arrival in the foundry where the workman is removing the cores and delivering them to the moulders. It will be noticed that the regular shop railway track runs on the foundry floor, and by observing the amount of sand on this track one can readily realise what a shaking a carload of cores would get while traversing such a track.

FIG. 1.—CORE CARRIER BEING UNLOADED IN THE FOUNDRY.

When the manufacturer who built this device was requested to figure on it he was asked if he would guarantee it to

work smoothly and to transport cores successfully. Acting in his usual conservative way he replied that he could not guarantee to transport cores without breaking them until the device had been tested. When it was installed it was found so successful that its use has been extended.

Attention is called to the fact that the racks for the storage of cores in the core department, shown in Fig. 1, are also made from pipe and pipe fittings. In this view the truck is shown suspended from the switch, which serves to transfer the truck to any one of three different overhead runways. No damage to cores has resulted in any way from turning corners or passing over these switches.

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TRADE TALK.

THE TRUSTY ENGINE WORKS, Cheltenham, are being offered for sale by private treaty.

MESSRS. NAPIER & MILLER are adding marine engineering to their works at Old Kilpatrick.

MR. EVENCE COPPEE has removed his offices to 19, Bishop's Road, Paddington, London, W.

GWYNNES, LIMITED, have opened offices at 4 and 5, Collingwood Buildings, Newcastle-on-Tyne.

NEW engineering works will shortly be established at York by Messrs. John E. Gibbs & Maclean.

MR. J. D. GIBSON, engineers' furnisher, has removed from 74, York Street, to 93, Hope Street, Glasgow.

MESSRS. BAGSHAWE & COMPANY, engineers, have acquired 17 acres of land at Dunstable for new works.

THE NEW SOUTHGATE ENGINEERING COMPANY, Eastcheap, London, E.C., have been adjudged bankrupts.

MESSRS. W. RILEY and C. STOCKTON, engineers, Idol Lane, Eastcheap, London, E.C., have dissolved partnership.

MESSRS. YATES, HAYWOOD & COMPANY, ironfounders, have removed to 15, Berners Street, Oxford Street, W.

MESSRS. J. APPLEBY, S. BROGDEN and T. F. BROGDEN, engineers, etc., Scarborough, have dissolved partnership.

A fire broke out recently at the works of the Humber Engineering Company, Grimsby, doing considerable damage.

THE NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED, have received an order for 54 locomotives for the Indian State Railways.

MR. R. O. WYNNE-ROBERTS has established himself in business as a consulting engineer at 5, Victoria Street, London, S.W.

THE STANTON IRONWORKS COMPANY, Nottingham, are supplying cast-iron pipes to the Ashton-in-Makerfield Urban District Council.

MESSRS. J. BOULTING & SON, 5 and 6, Upper Marylebone Street, W., have opened a branch at 51, Bishopsgate Street Within, E.C.

THE BRITISH THOMSON-HOUSTON COMPANY, LIMITED, have opened a new office in the Maritime Buildings, Albert Road, Middlesbrough.

THE PULSOMETER ENGINEERING COMPANY, LIMITED, have opened offices at 206, Corn Exchange Buildings, Cathedral Street, Manchester.

MESSRS. HIRST & COMPANY, Glasgow Rolling Stock and Plant Works, propose leasing the Bridgend Wagon and Engineering Company's Works.

BURYS & COMPANY, LIMITED, Regent Works, Sheffield, have appointed Mr. H. H. Hamilton, 16, St. Enoch Square, as their Glasgow representative.

MAWDSLEYS, LIMITED, Zone Works, Dursley, Glos., have appointed Messrs. Pooley & Austin, 25, Victoria Street, S.W., as their sole London agents.

MESSRS. W. PARSONS and C. S. WILLS, ironfounders, Leadenhall Street, London, E.C., trading as Parsons & Wills and the Carlton Iron Foundry Company, have dissolved partnership.

THE contract for the turbine engines and boiler installation of the cruiser "Boadicea," being built at Pembroke, has been placed with John Brown & Company, Limited, Clydebank.

MR. F. T. HANKS, 1, Higham Place, Newcastle-on-Tyne, has been appointed Newcastle and District agent of Evershed & Vignoles, Limited, Acton Lane Works, Chiswick, London, W.

THE Engineering Standards Committee are issuing an appeal for funds to continue the work in hand, and to raise the sum of £2,000 per annum to meet the estimated expenditure of the next three years.

THE new works of the Gilbert Little Company, Limited, at Great Horton, Bradford, have now been thoroughly equipped for the manufacture of various

engineering appliances for the automatic transmission of materials.

ADAMSON, RAMSBOTTOM & COMPANY, LIMITED, Cleveland Engineering Works, Birkenhead, have appointed Messrs. Robinson & Jones, 21, Collingwood Street, Newcastle-on-Tyne, as their sole agents for the Northern Counties.

MESSRS. CAMMELL, LAIRD & COMPANY are stated to have finally decided upon the Swansea site for their new works on the Welsh seaboard. We understand, however, that though the company are likely to arrive at such a decision, the report is somewhat premature.

THE first meeting of the creditors of E. Peckham, 17, Queen Anne's Chambers, Westminster, trading as the Peckham Engineering Company, was held in London during the month. The creditors left the case in the hands of the Official Receiver to be wound up in the ordinary course.

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PERSONAL.

A MOVEMENT has been started in Darlington to raise a memorial to the late Sir David Dale, Bart.

MR. WATSON FOGGO has been appointed managing director of the Yorkshire Engine Company, Limited.

MR. T. H. WEBB has been appointed general manager of the Alma Machine-Tool and Engineering Works, Liversedge.

MR. F. J. JONES has been elected a director of the Yorkshire Engine Company, Limited, in place of Mr. W. H. S. Craven, resigned.

THE gross value of the estate of the late Mr. H. M. Rait, of Rait & Gardiner, engineers, Fenchurch Street, London, E.C., is £54,836.

THE late Mr. T. D. Swift, managing director of the Ince Wagon and Ironworks, Limited, left estate of the gross value of £9,176.

MR. H. DAVIES, director of the Ebbw Vale Steel, Iron and Coal Company, Limited, has retired, and will be succeeded by his son, Mr. W. Davies.

THE value of the personal estate of the late Mr. D. A. MacTavish, director of the London and Glasgow Engineering and Shipbuilding Company, Limited, is £9,097.

MR. C. J. BAGLEY, managing director of the Cargo Fleet Iron Company, Limited, has resigned, but will remain a director of the company. He is succeeded by Mr. Benjamin Talbot.

MR. J. CAMERON, senior member of Cameron & Roberton, Limited, South Bank Iron Works, Meiklehill, has been the recipient of a presentation from the employés on the occasion of his marriage.

MR. W. BEARDMORE, of William Beardmore & Company, Limited, Glasgow, has had conferred upon him the Fourth Class of the Order of the Rising Sun, in connection with the recent visit of Prince Fushimi to this country. Other honours conferred by the Mikado include the following:—Sir Charles MacLaren, M.P., chairman of John Brown & Company, Limited, the Order of the Sacred Treasure, Third Class; Mr. Dunlop, joint managing-director of the Company at Clydebank, the Order of the Rising Sun, Fourth Class; Col. Vickers, chairman of Vickers, Sons & Maxim, Limited, the Third Class of the Order of the Rising Sun; and Mr. A. Vickers, Lieutenant Dawson, and Mr. J. Dunn, directors of the Company, the Fourth Class of the Order of the Rising Sun.

—o—

DEATHS.

MR. FRANCIS BOLLING, senior partner in the London firm of Bolling & Lowe.

MR. D. DOW, a well-known ironfounder, of Kirkintilloch, Scotland, at the age of 64 years.

MR. J. WALSH, one of the directors of the New Conveyor Company, Limited, of Smethwick, near Birmingham.

MR. M. SCRAGG, of Messrs. Taylor, Lang & Company, Castle Iron Works, Stalybridge, aged 89 years.

MR. J. E. BUNTING, cashier and accountant at Messrs. James Oakes & Company's iron works, aged 40 years.

SIR CHARLES MARK PALMER, Bart., M.P., head of the well-known firm of Palmer's Shipbuilding and Iron Company, Limited, of Jarrow.

MR. J. H. MCILWAINE, senior partner in the shipbuilding and engineering firm of McIlwaine & Lewis, afterwards McIlwaine & McColl, Limited, Belfast.

MR. W. HORSFALL, a well-known Leeds engineer and inventor, in his 81st year. The deceased gentleman was the founder of, and consulting engineer to, the Horsfall Destructor Company, Limited, Leeds.

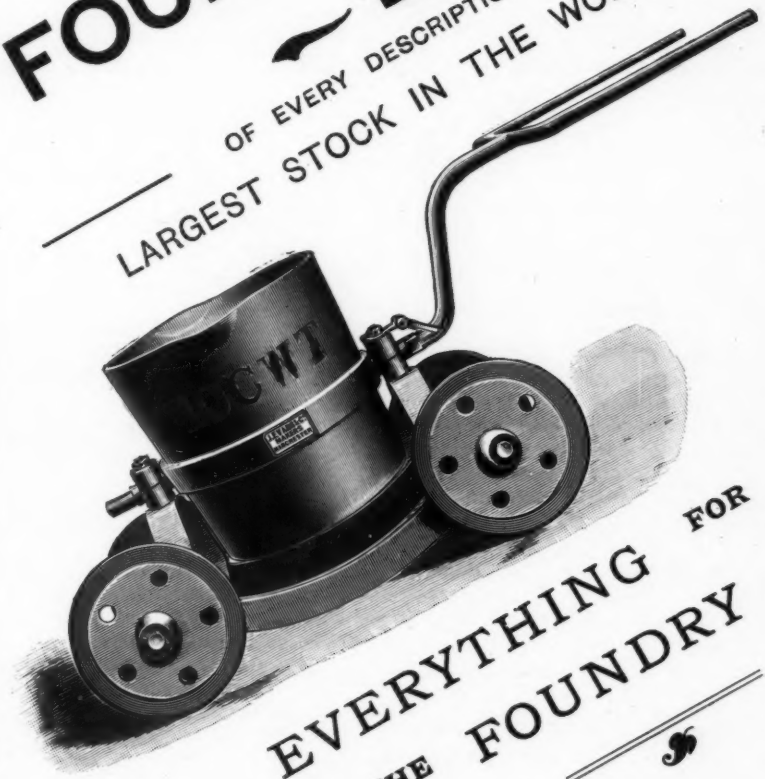
MR. G. SHAW, a director of the Brightside Foundry and Engineering Company, Limited, the Hull Forge Company, Limited, and chairman of J. Shaw & Company, Limited, Sheffield, aged 70 years.

Contractors to H.M. Government.

FOUNDRY LADLES

OF EVERY DESCRIPTION.

LARGEST STOCK IN THE WORLD.



EVERYTHING FOR THE FOUNDRY

JAMES EVANS & CO.,

Telegrams:
"LADLES, MANCHESTER."
"BLACKINGS, GLASGOW."

BRITANNIA WORKS, MANCHESTER.

NEW COMPANIES.

TURBINE CORPORATION, LIMITED.—Capital £150,000.

HANKOW ENGINEERING DEVELOPMENT SYNDICATE, LIMITED.—Capital £1,000.

CLARK'S MACHINE TOOL COMPANY, LIMITED.—Capital £3,000, to acquire the existing business.

CHILD BROTHERS, LIMITED.—Capital £1,000, to carry on the business of workers in iron, etc.

NETHERTON BOILER WORKS, LIMITED.—Capital £50,000, to acquire the business of H. & T. Danks.

BON-ACCORD ENGINEERING COMPANY, LIMITED.—Capital £5,000. Registered office: Justice Mill Lane, Aberdeen.

DOBSON & BARLOW, LIMITED.—Capital £500,000, to acquire the business of Dobson & Barlow, Limited, founders, etc.

STANDARD TURBINE COMPANY, LIMITED.—Capital £10,000, in £1 shares. Registered office: 66, Fenchurch Avenue, E.C.

PINK BANK FOUNDRY, LIMITED.—Capital £1,000, in £5 shares. Registered office: Levenshulme Road, Gorton, Lancs.

CASTLEHOUSE BROTHERS, LIMITED.—Capital £2,000, to acquire the business of Castlehouse Brothers, engineers, Scarborough.

THOMAS ASTBURY & SON, LIMITED.—Capital £50,000, to acquire the engineering business of Thomas Astbury & Son, Smethwick.

B. F. WILD & COMPANY, LIMITED.—Capital £5,000, to acquire the ironfounding business carried on at Reading as Wild & Company.

BEAUMONT ENGINEERING COMPANY, LIMITED.—Capital £2,000, to acquire the business carried on at 1 to 9, Prestcott Street, Birmingham.

WILLIAM BATH, LIMITED. — Capital £2,000, to carry on the business of manufacturers of locomotives, etc. Registered office: 25, Victoria Street, S.W.

THOMAS & PARKYN, LIMITED.—Capital £2,000, to take over the business of the Vivian Thomas Engineers' Supply Company, West Bute Street, Cardiff.

JOHN PERKS & SONS, LIMITED.—Capital £35,000, to acquire the business of edge-tool manufacturers, etc., at Wolverhampton, of John Perks & Sons.

MILLEN & SOMERVILLE, LIMITED.—Capital £25,000, to acquire the engineering business of Millen & Somerville. Registered office: 11, King Street, Glasgow.

A DISSOLUTION of partnership is notified in connection with Messrs. H. M. Ellison and J. Hindle, brassfounders, of Leeds, who traded under the style of James Ellison.

H. E. RICHARDSON, LIMITED.—Capital £2,000, to take over the engineering business of H. E. Richardson, 1 and 1A, Nottingham Place, High Road, North Finchley.

FENTON, HORROCKS & COMPANY, LIMITED.—Capital £2,000, to acquire the ironfounding business at 1, Berkshire Street, Manchester, of George Fenton & Company.

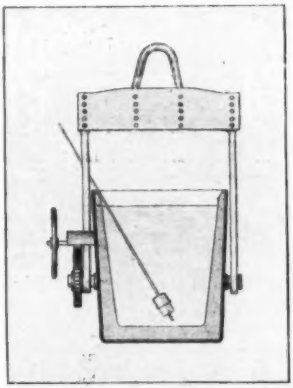
MESSRS. G. D. FOSTER and C. G. FOSTER, general brassfounders, of Birmingham, trading under the style of G. & C. Foster & Company, have dissolved partnership.

JOHN STIRK & SONS, LIMITED.—Capital £20,000, to acquire premises of John Stirk & Sons, Halifax, and the Northern Engineering Company, and to carry on the business of ironfounders, etc.

Ganister, Cupola Blocks, Fire Bricks,
Fire Clay.
Silica Bricks, Tuyeres, Stoppers, Nozzles, &c.
Steel Moulders' Composition, Silica Cement.

J. GRAYSON LOWOOD & Co., Ltd.,
DEEPCAR, nr. SHEFFIELD.
Telegrams: "LOWOOD, DEEPCAR."

PREVENTION OF BLOWHOLES IN CAST IRON.



A tin of our special compound fixed on a rod is held at bottom of ladle as shown; a strong re-action being thereby set up frees the iron from gases and impurities, which rise to the top.

RESULT: A denser casting of finer grain with increased strength.

For Particulars apply to—

THERMIT LIMITED,

27, MARTIN'S LANE, CANNON STREET,

Telephone—3749 Central.
Telegrams—"Fulmen," London.

LONDON, E.C.

ELDERS FOUNDRY COKE

As supplied to the British . . Admiralty Dockyards.

The following, selected from numerous letters, are eminent testimony as to the quality of our celebrated "A.A.A." Coppee Foundry Coke, carefully selected, and despatched in sheeted wagons.

From PECKETT & SONS, Bristol.

Bristol, October 25th, 1904.

We have been using your Selected Foundry Coke for some considerable time.
We have pleasure in stating that we are very pleased with it, as we find we get sounder and cleaner castings, more free from blow-holes and other defects, than we formerly did.

From MOUNTFORT PHILLIPS & Co., Llantrissant.

Llantrissant, October 25th, 1904.

In reference to the Foundry Coke you have been supplying us with for the last six months, we have very great pleasure in letting you know that it has given every satisfaction, and that our Works Manager and Workmen give it the highest praise.

Elders Navigation Collieries, LTD. Cardiff.

PRICES OF METALS.

The following table shows the approximate latest prices and position of stocks of metals during the past two years :—

METALS.	1906-7.	1905-6.
Iron—Scotch pig warrants ... ton	*65/0	*56/6
—Middlesbro' warrants ... ... ton	56/9	50/0
—W.C. M/nos Bessemer ... ... ton	81/6	67/6
—Stock, Scotch, June 27 ...tons	2,200	12,000
Copper—Chili bars, GMB ... ... ton	£97 17/6	£82 0/0
—Stock, Europe & afloat... ... tons	11,181	9,986
Tin—English ingots ton	£195 10/0	£180 0/0
—Straits ... ton	£191 15/0	£174 5/0
—Stock, Ldn. Hind and afft ... tons	11,612	13,520
Lead—English pig ton	£20 15/0	£16 17 6
Spelter—Ord. Silesian ... ... ton	£24 10/0	£27 1 3
Quicksilver—(75lb.) bottle	£6 16/0–£7	£7 5 0
Antimony—Regulus ... ... ton	£53–£55	£115 0 0

*Settlement price.

CASTINGS.

In the Cleveland district the following are the nominal rates current for castings :—

	£ s. d.		£ s. d.
Columns (plain)	7 0 0	to	7 5 0
Pipes, 1½ to 2½ in.	5 10 0	to	5 15 0
,, 3 to 4 in.	5 2 6	to	5 10 0
,, 5 to 8 in.	5 0 0	to	5 2 6
,, 10 to 16 in.	5 0 0	to	5 2 6
,, 18 to 24 in.	5 0 0	to	5 2 6
Chairs	4 2 6	to	4 5 0
Floor plates (open sand)	3 12 6	to	3 15 0

SCRAP.

The quotations for scrap, subject to market fluctuations, are as follows: — Heavy wrought (mixed), £2 17s. 6d.; light wrought, £1 12s. 6d.; heavy cast, £2 11s. 6d.; all per ton f.o.b., London. Copper (clean), £88; brass (clean), £59 10s.; lead (usual draft), £19; tea lead, £17 5s.; zinc, £19 15s.; all per ton delivered merchant's yard.

SILICA FIRE BRICK Co.,

OUGHTIBRIDGE.

GROUND GANISTER,

Wet or Dry.

Silco Cupola Bricks, 90 % Silica.

Better than Fire-clay Bricks for Cupolas.

Established 1863.

Jas. Durrans & Sons,

PHŒNIX WORKS, PENISTONE, Near Sheffield.

Manufacturers of all

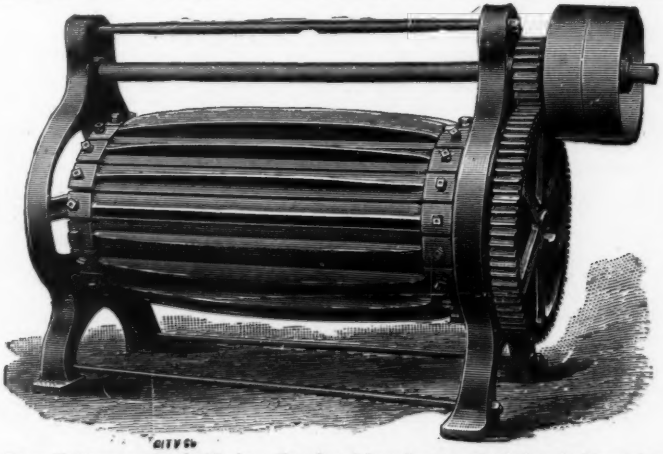
FOUNDRY EQUIPMENTS,

Composition Black Lead,

Plumbago, Core Gum, White Dust, and Coal Dust.

Ladles, Cupolas, Fire Bricks, Gannister, Stone Flux, Loam and Sand Mills, Casting Cleaners, Studs, Chaplets, Pipe Nails, Sprigs, Brushes, Wire Brushes, Core Ropes, Bellows, Buckets, Spades, Forks, Riddles, Sieves, Barrows, &c.

IMPROVED FOUNDRY RATTLER or FETTLING DRUM.

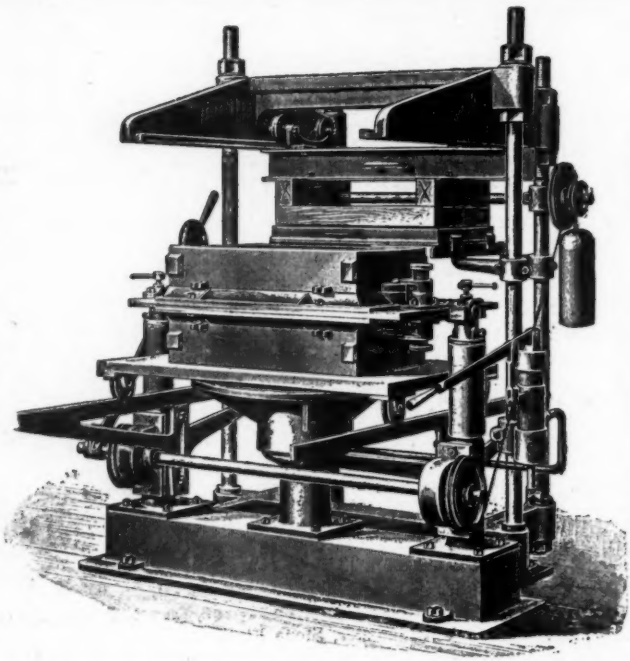


These Machines are invaluable for a Foundry, doing a larger amount of work of a superior quality, in a much shorter time than can be done by hand, without skilled labour.

"Dear Sirs,—We have been using your best Blacking for a large number of years, and always use it on our large Ingot Moulds, which, as you know, we have made up to 85 tons in weight.

"Yours faithfully, THE BRIGHTSIDE FOUNDRY & ENGINEERING CO., LD."

"ATLAS" METALLIC CEMENT.



"ATLAS" METALLIC CEMENT.

HYDRAULIC MOULDING MACHINE

Pattern "L."

This machine is fitted with a revolving pattern plate carrying one half of the Pattern on each side. It is constructed in all sizes from 19 in. by 10 in. to 87 in. by 87 in., and can be arranged with a draw up to 20 in. Bottom and top boxes are made alternately. With small machines the extraction of the pattern is done by a lever, with the larger sizes by hydraulic power. The machine is unsurpassed for deep work and we shall be pleased to show it to you in operation here.

WE ALSO MAKE

SAND BLASTS OF A NEW CONTINUOUS TYPE

Which do not require to be stopped to re-charge with sand.

THE LONDON EMERY WORKS Co.,

Park, Tottenham, LONDON, N.

SITUATIONS VACANT.

WANTED, FOUNDRY FOREMAN, accustomed to General Engine and Gas Engine Castings; able to estimate and take full control of men.—Write, stating previous experience and wages required, to Box 596, Offices of the FOUNDRY TRADE JOURNAL, 165, Strand, London, W.C.

FOUNDRY FOREMAN Wanted.—Young and up-to-date, to take charge of Grey Iron Foundry employing 40 hands, and making Light and Medium Machinery and Motor Work. Must be methodical and capable, and understand Moulding Machines, Melting and Mixtures of Iron, Cost Estimating, Weight Calculating, and Blue Prints.—Apply by letter, giving age, experience, references, and wage wanted, J. C. DALMAN & SONS, River Street, Birmingham.

FOUNDRY FOREMAN.—Wanted, practical man, experienced in all classes of work in Green and Dry Sand and Loam, to take charge of small Foundry. Non-Society man preferred.—Address, giving full particulars and wages required, to Box 560, Offices of the FOUNDRY TRADE JOURNAL, 165, Strand, London, W.C.

FOR SALE AND WANTED.

FOR SALE. "ROOT'S" PATENT BLOWERS.

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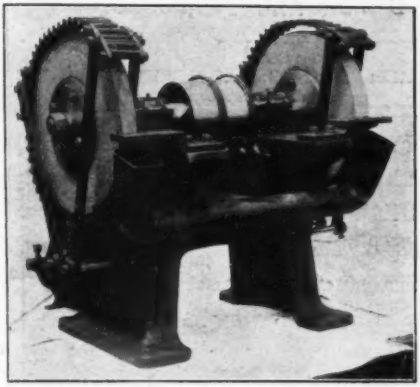

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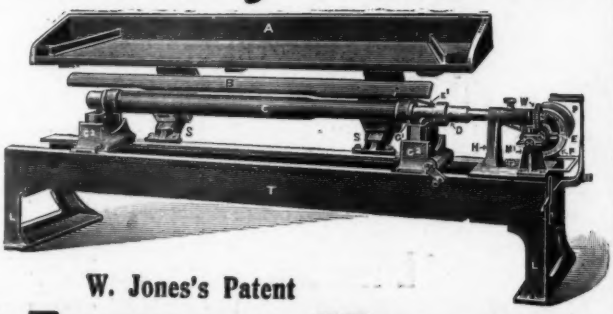

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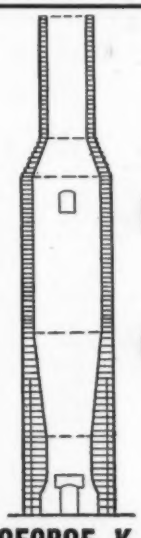

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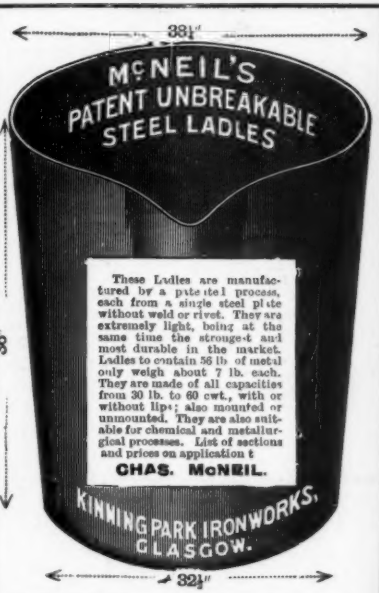
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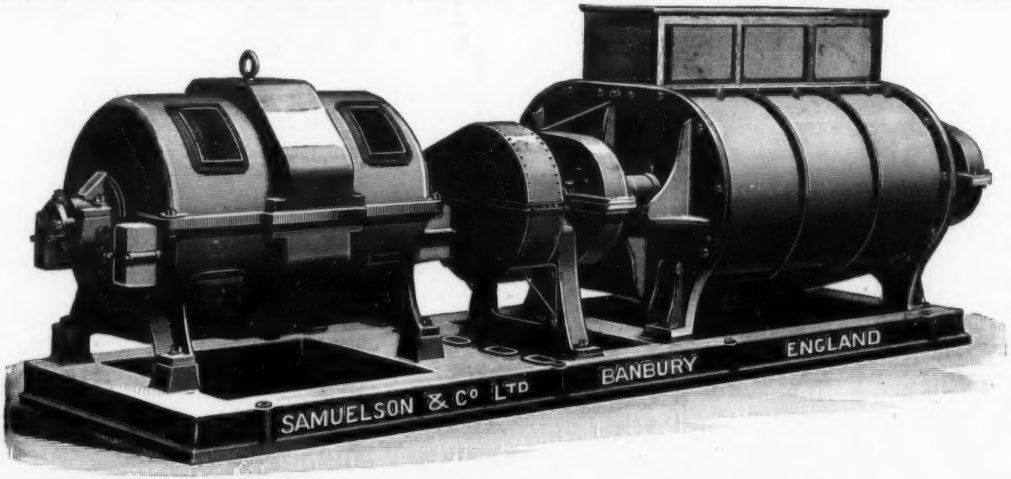

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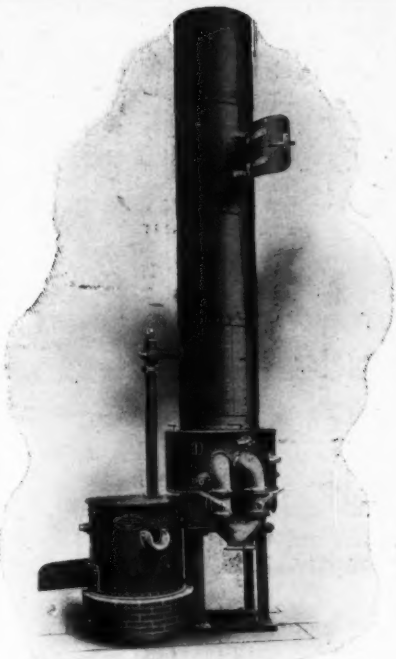

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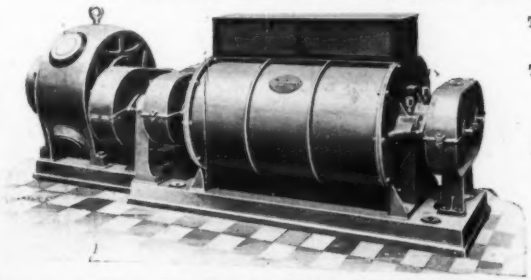

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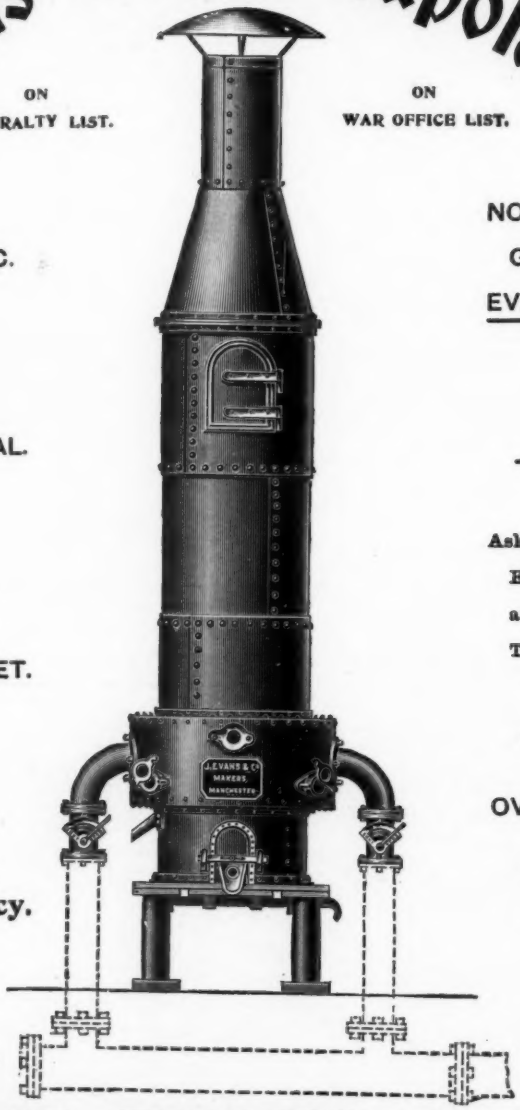

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